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AUGUST
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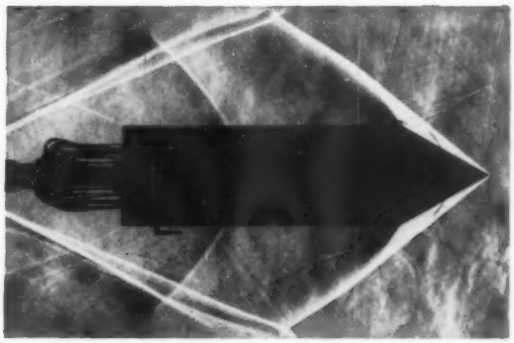
PHOTO METHODS FOR INDUSTRY

BOB FUHRING: ON THE EGGHEAD AND I — p 70



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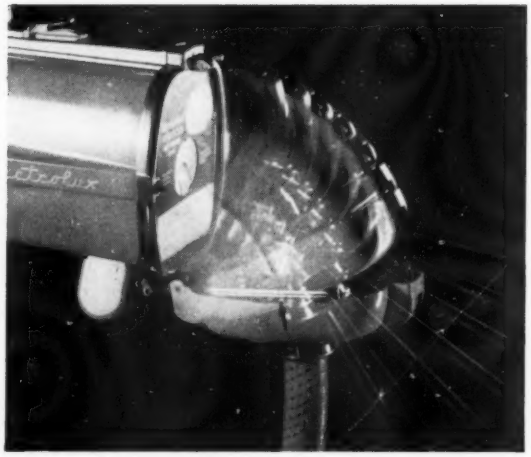
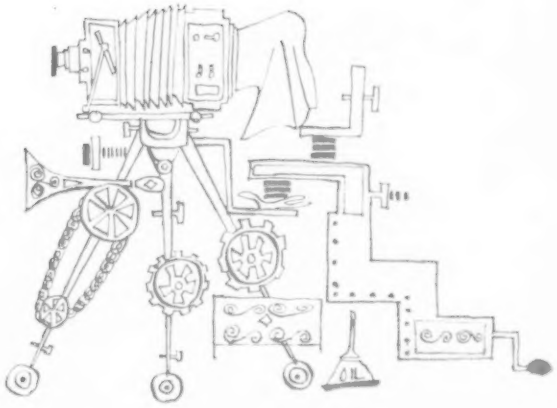
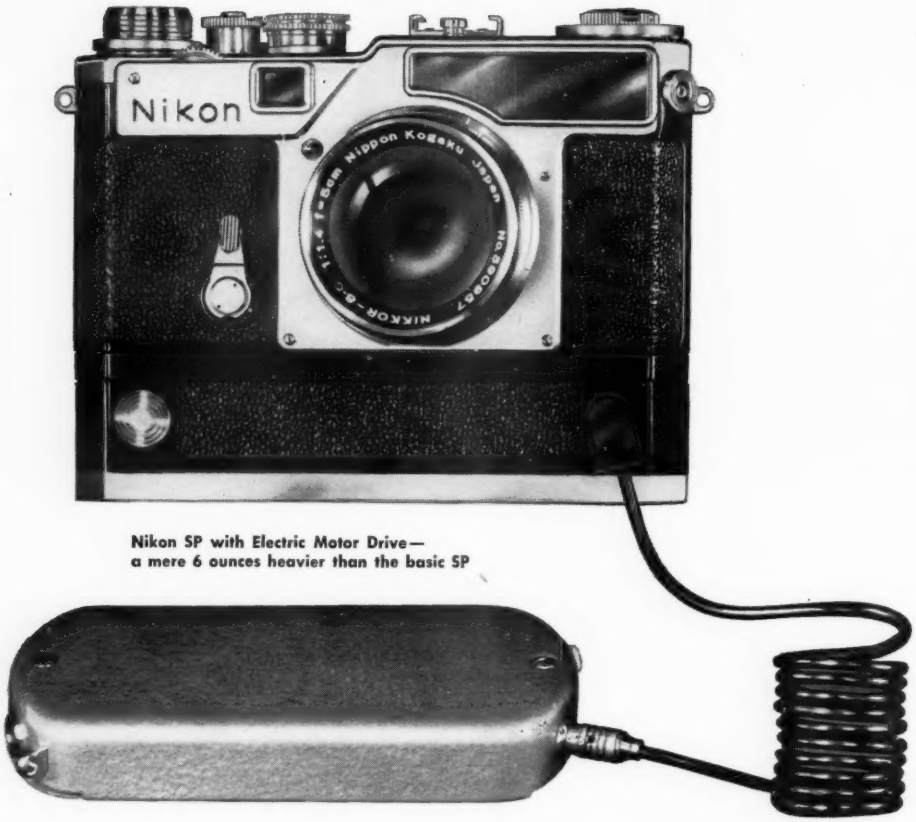


VICTOR KEPPLER: BREAD & BUTTER JOBS — p 24



MAURICE RICKARDS' PHOTO LEXICON — p 20

SPECIAL REPORT: WEST GERMAN CAMERA INDUSTRY



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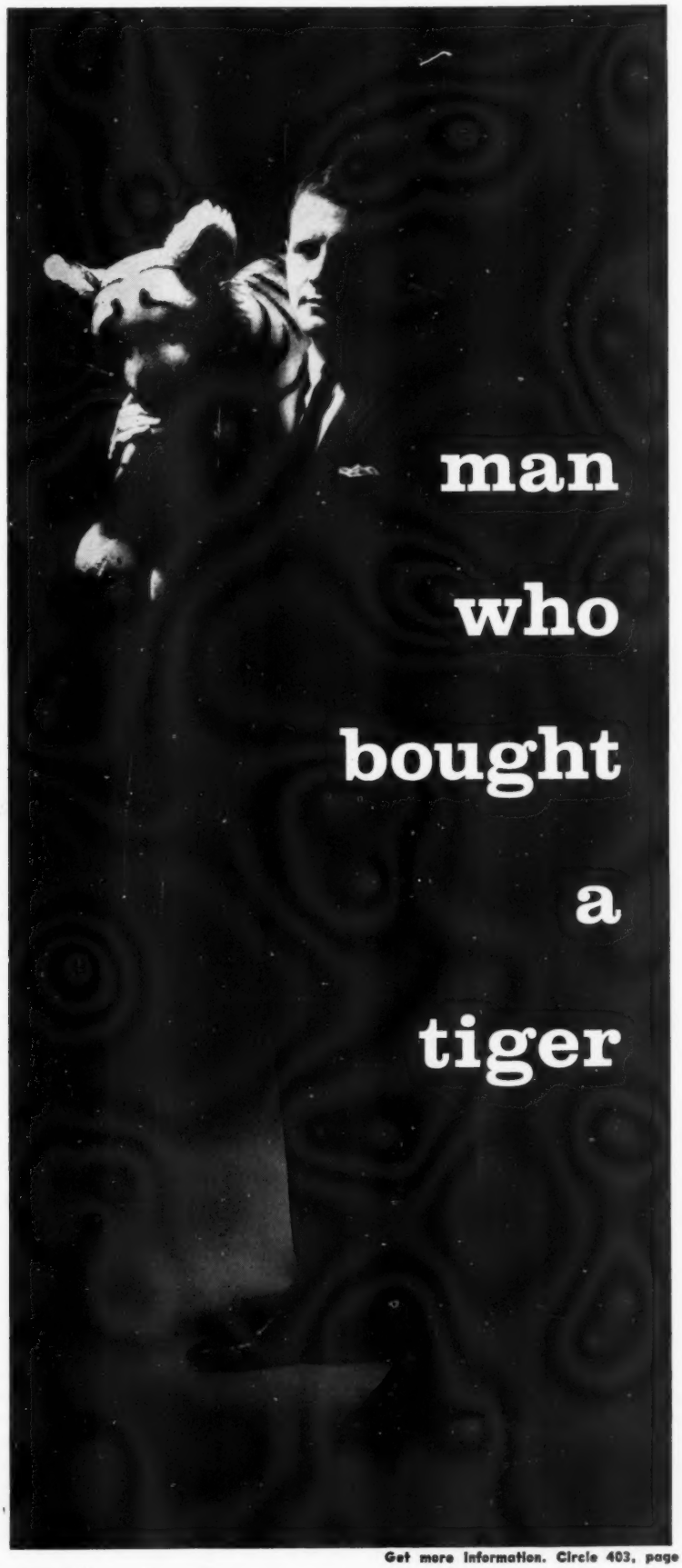
NIPPON KOGAKU TOKYO

Nikon Motor Drive Sequence of Ripple Rock Blast, by Bob Olsen, taken with Nikon SP and 85mm Nikkor Lens.



Once upon a time there was a man who bought a tiger. He loved it, cared for it, nurtured it until one day, the tiger ate him up.

However, like our foolish friend, many photographers buy tigers, especially when it comes to high-speed films. Most high-speed films look good when it comes to manufacturers claims and specifications. But in actual practice, results are grainy and lack resolution.

Knowledgeable photographers use the new Ansco Super Hypan® film. Super Hypan is fast. Exposure indexes of 500 are normal with speeds of more than 1000 easily attainable with extended processing. The grain and resolution characteristics are the finest ever attained in any high-speed film. In fact, Super Hypan's quality is more like that of a medium speed film.

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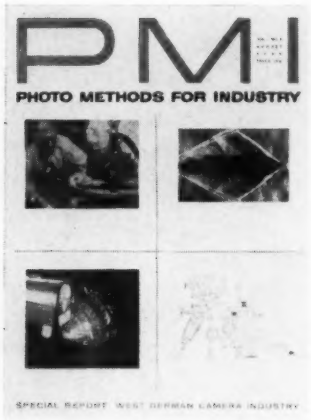

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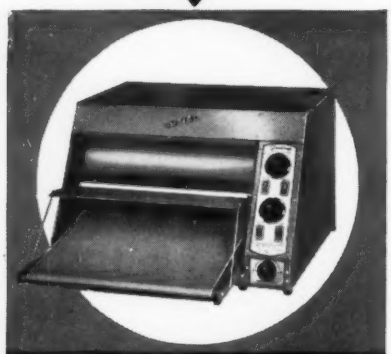
Beseler Dryer Model 1217K



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F.Y.I.

You can believe this or not. We picked it up from a Belgian publication, and since we're mighty impressed by practically everything we see in print, we're passing it on. Scheduled for unveiling at the Photokina is a new camera, manufactured in Monaco by Krupp, which is either the dryest practical joke or the most revolutionary piece of equipment designed since Dr. Barnack decided to make stills on movie film.

Dubbed the Monacoflex, this gadget, it says here, is an eye-level reflex that makes either a standard 6 x 6cm picture, or, on the same plot of film, four 2.9 x 2.9cm pictures. On the front bit is a zoom lens that stretches from 48mm to 240mm; rated at f/1.2 wide open, the preselector diaphragm can shrug itself down to f/32.

Open wide, now, because here's the hunk that's hard to swallow: No shutter—see? Just a plastic screen *with no moving parts.* The plastic is opaque when an electric current is passing through it, and becomes transparent when the current is interrupted! This electronic shutter is cocked with the same motion that works the film transport. Current? That's from a photoelectric cell, of course.

As we said, you don't have to believe the Monacoflex if you don't want to. We're not sure whether we do or not. Sometimes we feel science is wonderful, other times we feel that a few of Princess Grace's publicity boys must have been filling in a rainy Sunday afternoon and dreamed it up.

Just to be on the safe side, though, if any of the Krupps read this, and the Monacoflex is on the level—we'd sure like to have one!

Strictly for pros, I

The American Institute of Architects is now putting together its third no-entrance-fee exhibition of architectural photography. Open to all professionals, the show will be selected by a jury consisting of two photographers and an architect, who will also select the awards of merit.

Full details are available from Mrs. Alice G. Korff, Curator of Gallery, the American Institute of Architects, 1735 New York Avenue, N.W. Washington 6, D.C.

Strictly for pros, II

Manhattan Color Lab, Inc., has just moved and installed a flock of high-priced precision equipment, including timing devices, voltage stabilizers, a slide and stereo optical printer, an animation stand for filmstrip photography and the latest thing in filmstrip printers. Pretty proud of their new layout, they've decided to cater primarily to the professional filmstrip producer; in fact they hereby issue an invitation to all filmstrip producers to drop in and see them. No obligation to produce any filmstrips. The address is 210 West 65th St., N.Y.C.

Picking up the pieces

Scrambled were the following facts in the July issue: The correct price of the Realist 500 35mm projector is $29.95, not the fanciful figure named on page 35.

The correct name of the manual 100-ft. 35mm processor on page 65 is the Nikor Film Processing Machine.

How nice of Zeiss

John W. Doscher. FPSA, FRPS, lecturer and teacher of photography, will present a Zeiss-sponsored, illustrated series of lectures on color photography in the west starting in October. He will appear in the western states on the following schedule: Milwaukee, Wis., Mon., Oct. 20; Minneapolis, Minn., Wed., Oct. 22; Davenport, Ia., Fri., Oct. 24; Des Moines, Ia., Mon., Oct. 27; Denver, Colo., Fri., Oct. 31; Salt Lake City, Utah, Mon., Nov. 3; Spokane, Wash., Thurs., Nov. 6; Seattle, Wash., Mon., Nov. 10; Tacoma, Wash., Tues., Nov. 11; Portland, Ore., Thurs., Nov. 13; Sacramento, Calif., Mon., Nov. 17; San Francisco, Calif., Tues., Nov. 18; San Jose, Calif., Wed., Nov. 19; Fresno, Calif., Fri., Nov. 21; Los Angeles, Calif., Mon., Nov. 24; San Diego, Calif., Tues., Nov. 25; Phoenix, Ariz., Mon., Dec. 1; Albuquerque, N.M., Thurs., Dec. 4.—THE END

LETTERS

To the Editor:

I am immensely pleased with PMI and I appreciated Lloyd E. Varden's article on the process lens in the June, 1958 issue.

Articles of this character are desperately needed! So many essential facts of optics and the photographic processes are withheld from the average photographer for reasons difficult to fathom. I assume it is because there is small liaison between the labs and the production centers and the photographers.

The article clarifies the effects of stopping down in relation to resolution, and also mentions the problems of flare. I liked the use of "exposure units" to explain the effect on contrast of flare. . . .

One point I would like to present: perhaps it has been discussed in the literature somewhere but I have not found it. It is flare produced by the reflection of image light from the surface of the film itself! It is perfectly obvious that the reflectivity of the sensitive film is nearly double that of the standard grey card. The reflected light apparently bounces mostly to the rear surface of the lens and the lensboard—and then back to the film. I believe it causes quite a lot of flare. It could be minimized by putting "V" corrugations over the surface of the back of the lensboard. Some trials I have made suggest that about half of the usual camera flare comes from this source!

Another point which I feel could be discussed most effectively relates to the erratic effects obtained by developing too many films in a given quantity of developer. It is a simple matter to explain that as a developer is used its energy is depleted. But I do not think many photographers realize that the developing time of, say, ten 4 x 5 films in 32 ozs. of solution will necessarily be longer than the developing time required for three or four films in the same amount of solution. This is elementary in principle, but not too easy to define in fact. Adequate agitation is, of course, not easy in a crowded tank, but this can be achieved reasonably well. It is the progressive depletion of the developer—with attendant lengthening of optimum developing time—that needs clarification. It is, of course, apparent in both tank and tray development.

Cordially,
Ansel Adams
San Francisco, Calif.

(continued on page 98)

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ROBOT Royal 36a w/ZEISS Sonnar 50mm f/2
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by Herbert P. Paschel

REPRODUCTION & GRAPHIC ARTS

PXA lamps may be the solution to many graphic illuminant problems

The slow-speed photo-sensitive films and plates used in line and halftone photography, plus the light limiting factors of halftone screens, use of small lens apertures, filters, prisms, etc., make a high intensity light source mandatory. In order to meet the requirements of all possible uses, the ideal, all-purpose graphic arts light source should have the following characteristics.

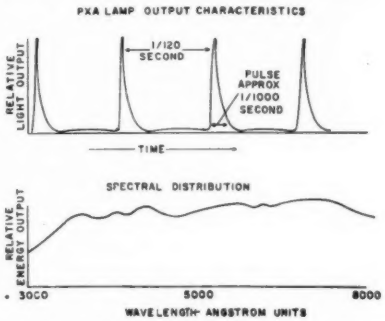
a) High intensity.
b) Ability to concentrate available light on work area.
c) Spectral distribution to be continuous and balanced in visible spectrum plus radiation in near ultra-violet and near infra-red.
d) Instant starting.
e) Consistent output in both intensity and color temperature.
f) Minimum temperature rise.
g) Clean (No fumes or dust).
h) Efficient power factor.
i) Low maintenance.

This imposing array of requirements creates any number of obstacles not easily overcome by most radiant energy sources. The introduction of the electronic flash lamp was viewed with considerable interest by the graphic arts. In the conventional form, however, the speed light not only failed to meet the needs of process photography but the one-a-second high intensity flashes were psychologically disturbing to the user.

The electronic flash lamp is a particular application of that category of illuminants known as gaseous discharge lamps. The essential difference is that in the "flash" lamp a sudden surge of power is released through the tube to produce a momentary light of high intensity. The basic discharge lamp emits a continuous stream of light although, of course, it fluctuates in accordance with the line frequency.

Cooper-Hewitt tubes, high pressure mercury lamps, mercury-cadmium lamps and fluorescent tubes and grids (the latter having the added feature of luminescence), are examples of discharge lamps that have experienced limited or specialized application in the graphic arts.

Early flash lamps were of the mercury type while current lamps utilize xenon gas. The light emitted by this rare gas under certain conditions of pressure and current density very closely resembles sunlight in composition. Technical literature, over the years, reveals considerable activity in discharge lamps utilizing xenon gas. Lamps of this type, for color photography and projection purposes, are available in Europe.



The latest development in this category is the Pulsed Xenon Arc (PXA, for short) and a unique ballast system for its operation, recently announced by the lamp division of General Electric Co., at Nela Park. Simultaneously, American Speedlight Corporation introduced a new line of lighting equipment, Ascorlux, based on the PXA lamp plus operating circuit.

PXA lamps are xenon filled quartz tubes less than a half inch in diameter, 3, 12, 24 or 36 in. long. In

the Ascorlux reflector, the tube is mounted within a tubular pyrex glass sleeve which provides a channel for forced draft air-cooling.

PXA lamps pulsate 120 times per second, the light being virtually extinguished most of the time except for the periodic flashes of one thousandth second duration. (For this reason such lamps are not reliable in exposure situations of less than a second.) Because of the rapidity of the flashes the lamp does appear to burn continuously—though a stroboscopic effect is noticeable.

Present models of the Ascorlux equipment include a 20x24-in reflector unit for the 24-in. tube, and a 28x36-in. reflector for the 36-in. tube. Three basic power supplies are furnished—two for the operation of a single tube, and a dual power pack for use with two 24 or 36-in. tubes. A compact 4x4-in. light grid for enlarger use, with its companion power unit is also marketed.

Reports of limited shop testing indicate highly satisfactory performance in connection with all types of camera exposures, exposing plates in vacuum frames and step-and-repeat machines, and exposing blueprint, silverprint and diazo papers and foils. In many applications significant savings in exposure time and power are reported.—THE END

Approximate Installation Costs—Ascorlux Equipment

For Camera Use*

1—B1108 Dual Channel Power Supply, 220V, AC	$2,275
2—L1101 20 x 24-in. Reflector Units, @ 495	990
2—FTA1125 24-in. PXA tubes with pyrex shell, @ 62	.124
2—S1101 Mounting Stands @ 80	160
	$3,549

**Two lamps, one each side, for front lighting of copyboard. Rear illumination can be with one or both lamps.*
†Not required with synchronized lamp carriers.

For Vacuum Frame & Step & Repeat Machines

1—B1104 Single Channel Power Supply, 220V, AC	$1,495
1—L1101 20 x 24-in. Reflector Unit	495
1—FTA1125 PXA tube in pyrex shell	62
1—S1101 Mounting Stand‡	80
	$2,132

‡May not be required if reflector units can be attached to available mounts.

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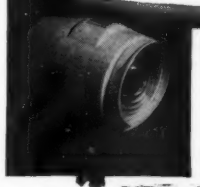

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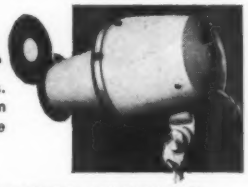

NEW ASCOR STUDIO BACKLIGHT

Solves backlighting, hairlighting and fill-in lighting problems. Features: wide angle coverage; soft color lighting; built-in modeling lamp; plug-in type construction; small size. In three models to operate with Series 300-400-500 Ascorlights.

NEW ASCOR HEAVY DUTY POWER SUPPLIES

B412—400 watt-second capacity portable unit with individual modeling lamp switches and 3 isolated light outlets (2-1-1 ratio). B413—300 watt-second capacity compact unit designed for production portraiture. Has 4 light outlets so that a main light, fill light, hairlight and backlight may be used (2-2-1-1 ratio). B420—a single light outlet, AC operated, 200 watt-second capacity unit especially desirable for school portraiture work.

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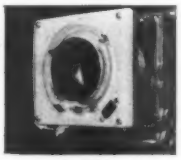

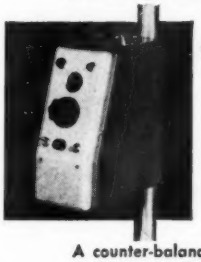

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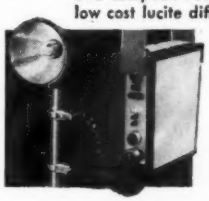

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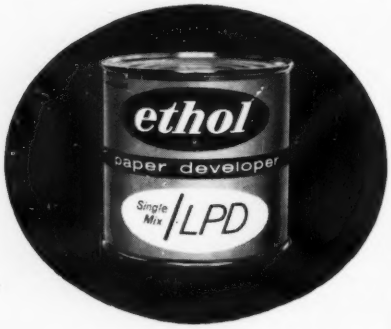

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by Lloyd E. Varden

PHOTO METHODS FOR TOMORROW

Tomorrow's graphic arts material, fading colors, and other jottings

Several months ago the Photo Products Department of DuPont announced their development of a photo-sensitive plastic printing plate, stating that its commercial availability was a year or two away. Mr. J. B. Woodson, Jr. of DuPont has just advised, though, that the new photopolymer plate has actually been in use in five types of printing plants for over six months on a field-testing basis.

The plate is designed for relief printing and consists of a lightweight plastic sheet, metal-backed. Following an arc-light exposure of a few minutes under a line or halftone negative, processing is accomplished in a simple water bath to wash away the non-insolubilized portions of the polymer.

Demonstration to be made

Progress in getting the new plate through its embryonic stages must have occurred more rapidly than originally anticipated. Yet, Mr. Paul H. Smith, who is in charge of the project for DuPont, insists that it will still not be possible to purchase the plate from graphic arts suppliers until late 1960. An advanced report on how the plate has performed in various applications, however, will be presented at an all-day letterpress printing forum in New York on September 27. The forum is being sponsored by the Printing Industry of America, International Association of Printing House Craftsmen, and the Research and Engineering Council of the Graphic Arts. It will be conducted by the New York Employing Printers Association, 461 Eighth Ave., New York, N. Y., but will be held at the Hotel Statler. A demonstration of making a printing plate with the photopolymer, plus a disclosure of the prototype equipment used in the process, will be given publicly for the first time via closed-circuit television. Sounds worth attending if you want to keep abreast of latest developments in the graphic arts.

Electrofax color

Speaking of new graphic arts processes, a color printing procedure based on the RCA Electrofax system of electrostatic image formation was described by Messrs. J. S. Rydz and S. W. Johnson of RCA at the Los Angeles annual meeting of the Technical Association of the Graphic Arts (TAGA), held June 22-26, 1958.

Although the principles of *Electrofax* have been frequently discussed, a brief review is probably in order because of the limited practical applications of the process in photographic fields. Certain grades of zinc oxide dispersed in a suitable resin binder, e.g., a chlorinated rubber, such as *Parlon,* when coated onto a paper stock exhibit photo-conductive properties which form the basis for this electrostatic image-producing system. The zinc oxide coating is given a uniform electrostatic charge by means of a high-voltage corona charging unit. Exposure to light causes this charge to be dissipated to ground because the light action on the zinc oxide induces local electrical conductivity in the layer. Wherever the electrostatic charges remain they can attract oppositely charged particles of various colored substances which are so constituted that when heat is applied to them they fuse and become permanently bound to the paper surface.

The process is capable of producing quite acceptable "line" reproductions. But its very restricted exposure scale, under the conditions normally existing in practically applying the process, make it unsuitable for the reproduction of continuous tone images. Therefore, Rydz and Johnson made use of halftone screened tri-color separations for simulating tone gradation effects, employing the Kodak contact screen procedure for producing them. Suc-

cessive electrostatic chargings of the zinc oxide layer, followed in each instance by exposure to one of the color separations and development with a pigment of appropriate color, permitted the three-color print image to be built up.

The color print example that Mr. Rydz kindly allowed me to examine was anything but world-shaking. But, the process cannot be arbitrarily discounted because an unfavorable evaluation of the initial experimental results.

News on 2-emulsion film

The Spring, 1958, issue of *Grossbild Technik*, among other items of interest, has an anonymously written account on the application of Agfa LM graphic arts sheet film for camera use in photographing normally difficult industrial subject material. Agfa LM film is described as a "special half-tone film with automatic masking" for use primarily in the graphic arts industries, with reference being made specifically to its use by photoengravers. Later, however, in relating the emulsion layer structure of the film it seemed to me that it is a special copying film similar—in terms of its tone reproduction characteristics—to Gevaert's *Correctone* film or Kodak's *Gravure Copy* film. The Agfa LM film is said to have an orthochromatic emulsion, over which is a higher contast, blue-sensitive emulsion. The highlight contrast rendering, which is governed by the top emulsion layer, is controlled by the extent of exposure. Such films are especially useful in making copy negatives to obtain selectively enhanced contrast in the highlight regions. They are used in the gravure printing industry for improving the brightness reproduction of highlights, which usually tend to have a flat, degraded appearance when regular commercial-type copying films are employed, unless special masks or hand retouching are resorted to. These same films can give superb copy negatives of photographic prints, wash drawings, etc., in regular photographic practice.

Now we learn that Agfa LM sheet film has been adopted to considerable advantage for photographing architectural subjects, studio subjects (such as a camera with black bellows and chromed metal parts), etc. In addition to the selective control of highlight contrast provided by the film itself, Farmer's reducer, diluted to 1/10 normal strength, is recommended for adjusting the highlights of a negative more meticulously.

In the very early days of modern, integral tripack color films the im-

uniform prints

Photo by Rick Waite, Boyer Studio

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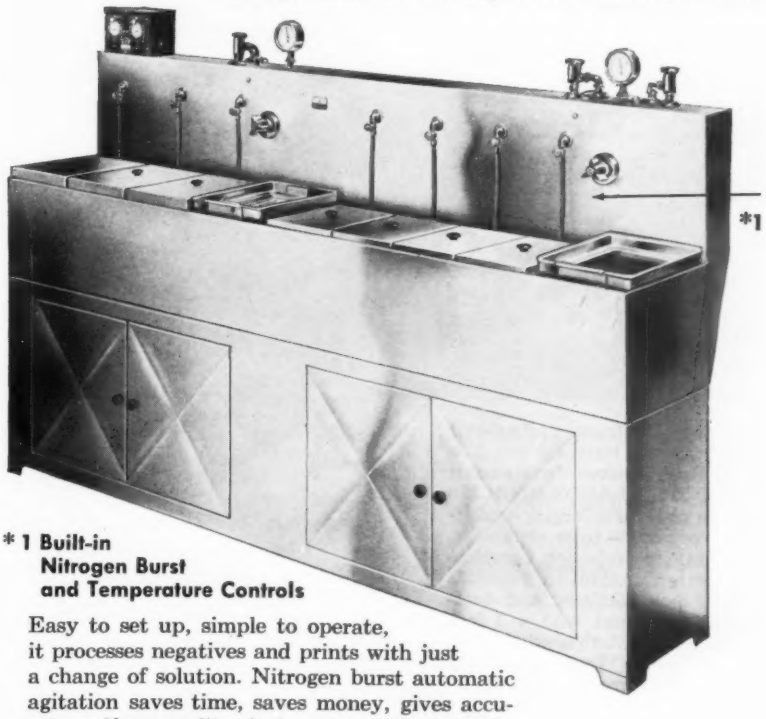

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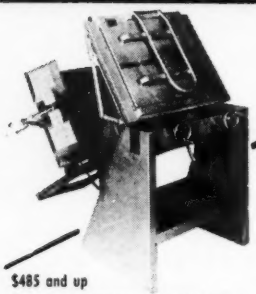

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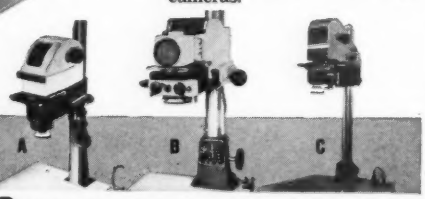

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ages faded in rather short order, even when films were stored in recommended cans and not excessively exposed to light. It is a great tribute to the cunning of dye chemists that in a relatively short period of time means were worked out whereby the life expectancy of color film images became so vastly extended beyond what it had been that moment to moment anxieties (similar to those experienced during a death-bed vigil) are now seldom aroused.

New data on color fading

Mr. Paul Horowitz and Mr. William R. Weller, in a paper published in the June, 1958 number of the Journal of the Society of Motion Picture and Television Engineers, present data relative to Eastman Color Print film that should discourage complacency in the matter. No doubt their findings apply in a general way to color films other than Eastman Color Print film, though not necessarily with respect to specific data.

Not much help for photog

Some—if not all—of the basic tenets discussed by these authors have been known for some time by those experienced in the processing of color films. But it is amazing what little amount of information has found its way into print regarding the factors that influence color image fading. The dyes themselves which make up the color image are not perfectly stable by any means. The types of dye formed in the customary modern color film are inherently less stable than certain other dye classes. However, many instances of color image fading are not directly due to the chemical structure characteristics of the dyes, although it could be argued that their pH sensitivity and accelerated fading in the presence of certain contaminants, as typical examples, are ultimately a function of chemical make-up. However, Horowitz and Weller show that the dyes should be given every possible break by careful adherence to color film processing recommendations. If the final washing is inadequate the hypo retained in the film can seriously shorten the life of the dye image, especially under conditions of high humidity and temperature. Also, the pH of the film after processing greatly influences the fading rate. In the words of the authors: "Experience indicates that adherence to recommended processing procedures is the greatest single factor in the prevention of dye fading." But how can one know if a particular color film processing laboratory follows recommendations to the letter?—THE END.

Everything's OK is the signal flashed to photographers by these streaks.

CHALLENGING ASSIGNMENT

How can one tell whether a jet engine mount would hold up under the jolts of rail shipment? This way.

Gene Lyle, of La Mesa, Calif., was handed as perplexing an assignment as ever photographer got when he was asked to find out what went on inside a boxcar. Seems there was some question as to whether the buck in which a jet engine was mounted for shipment would be subjected to dangerous sheer stresses while the train was in motion, and Lyle's job was to help engineers say whether it would or it wouldn't.

To take up the story in Lyle's own laconic maner: "Solution: Lights were soldered on engine and shipping buck, which was bolted to floor of box car. With side doors of car open, cameras were set up on ground outside. Their shutters, set on TIME, were opened as the locomotive closed a microswitch an instant before impact.

"Camera: We used three 4x5 view cameras because they were handy. Lenses: 127mm Ektars at 15 ft. Film: Almost immaterial. We used Royal Pan. Exposure. Nearly infinite since the subjects are small light sources registering as pinpoints and needle scratches on the film. . . . Shutters are opened about one second before impact of the locomotive and closed after the initial action about three seconds later. Anything from f/45 to f/1 would register on almost any black-and-white film.

"Ambient light: we usually make our photographs into the shadow side of the car at twilight to avoid overexposure. Lights attached to the subject are standard automobile tail or panel lights. We synchronized our cameras to the event the first time we tried a hump test by having the locomotive trip a microswitch near the track just before impact, after which we closed the shutters by hand, but we found this really unnecessary, so we subsequently abandoned it.

"The parallel paths of light give positive evidence, in this case, of lack of dangerous sheer stresses." Mission completed.—THE END

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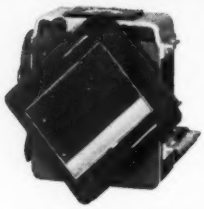

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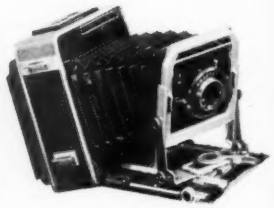

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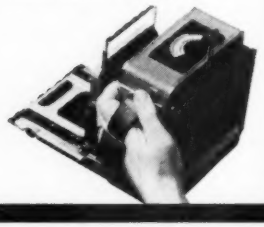

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AN EDITORIAL

ANTI-EFFICIENCY ADMINISTRATORS...

All that took place at the recent National Industrial Photographic Conference in Chicago is secondary to the gathering's larger meaning: that photography has very definitely arrived as an integral and indispensable part of the industrial scene.

While this speaks highly for the in-plant photographer's grasp of his own technique, the growing importance of his position places upon him a growing responsibility. The days when rule-of-thumb could get an inadequate man by are already in the past. Today's industrial photographers must know not only their own jobs—cold—but have a thorough understanding of the complexities involved in the industries they serve. As one photographer put it, "It's getting so I don't think of myself as just a photographer any more. My work is so technical I'm kind of a rough-and-ready engineer."

The engineers are the first to acknowledge the invaluable assistance they receive from the plant photographic department—so much so that many engineering units now have their own photo sections. Any group dealing with actual production or research doesn't have to be reminded that photography is a versatile, adaptable and inexpensive ally. It is proved to them every day. Where in-plant photo departments run into trouble is from the paperworkers, the "over-administrators," as that same photographer calls them.

It's high time the front office realized that no self-respecting technician wants to load himself up with equipment that will just gather dust. When a photographer makes an equipment recommendation he almost always has a specific job for it in mind, and has probably calculated a saving that will enable it to pay for itself. Any administrator who doesn't trust his photo staff ought to replace it—or maybe he's in the wrong job.

The Editors

ON PHOTOGRAPHING AIR DISTURBANCES

Shadowgraphs, schlieren and allied photographic techniques document "invisible" pressure changes in fluids—by Eugene Ostroff, SPSE

Long before any missile is fired, long before any man-created flying device reaches the trying-out stage, photography explores and analyzes potential performance. The industrial engineering laboratory uses photography as an important analytical device for rocket engineering and design. Modern wind tunnels and enclosed test ranges duplicate the supersonic flight conditions of outer space and permit the testing of missiles and airfoil performance under laboratory controlled conditions. The efficiency with which a rocket nose cone pushes aside both the atmosphere of the earth and the rarefied air of outer space determines whether or not we might have a new earth satellite or a moon-bound vehicle. As air flows around a test object in the wind tunnel, invisible disturbance patterns are formed. These invisible disturbances can be made visible with present day schlieren photographic techniques. From patterns recorded on film we can not only see where the design must be modified, but also calculate how fast it is possible to travel with the "push" from a rocket engine. On a warm summer day we have all seen through heated rising air the black-top macadam road twist and shimmer in the distance. Warm air rising from the road surface is less dense than surrounding air. Light waves passing through this warmer air are distorted (refracted) from their normal path on their way to our eyes. Schlieren photography, one of the techniques used to record similar air disturbance patterns, utilizes this principle of light refraction. We know that when light waves traveling through air (gas) enter at an angle, a medium of different density, these light waves change both their speed and direction. A spear fisherman knows from experience that he has to plunge his spear not where he *sees* the fish, but at a point somewhat removed. Similarly, variations in density of the air flow around the test object act as a refracting medium. By passing a parallel light beam through this flow and photographing the projected silhouette we are able to clearly record the flow pattern.

Shadowgraph of projectile at Mach No. 3.20. Photo and diagrams are published through the courtesy of the Supersonic Wind Tunnels Branch, Ballistic Research Laboratories Aberdeen, Md.

DIAGRAM A

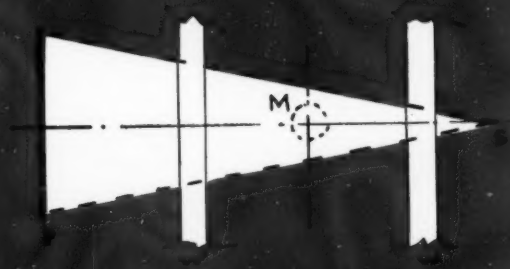
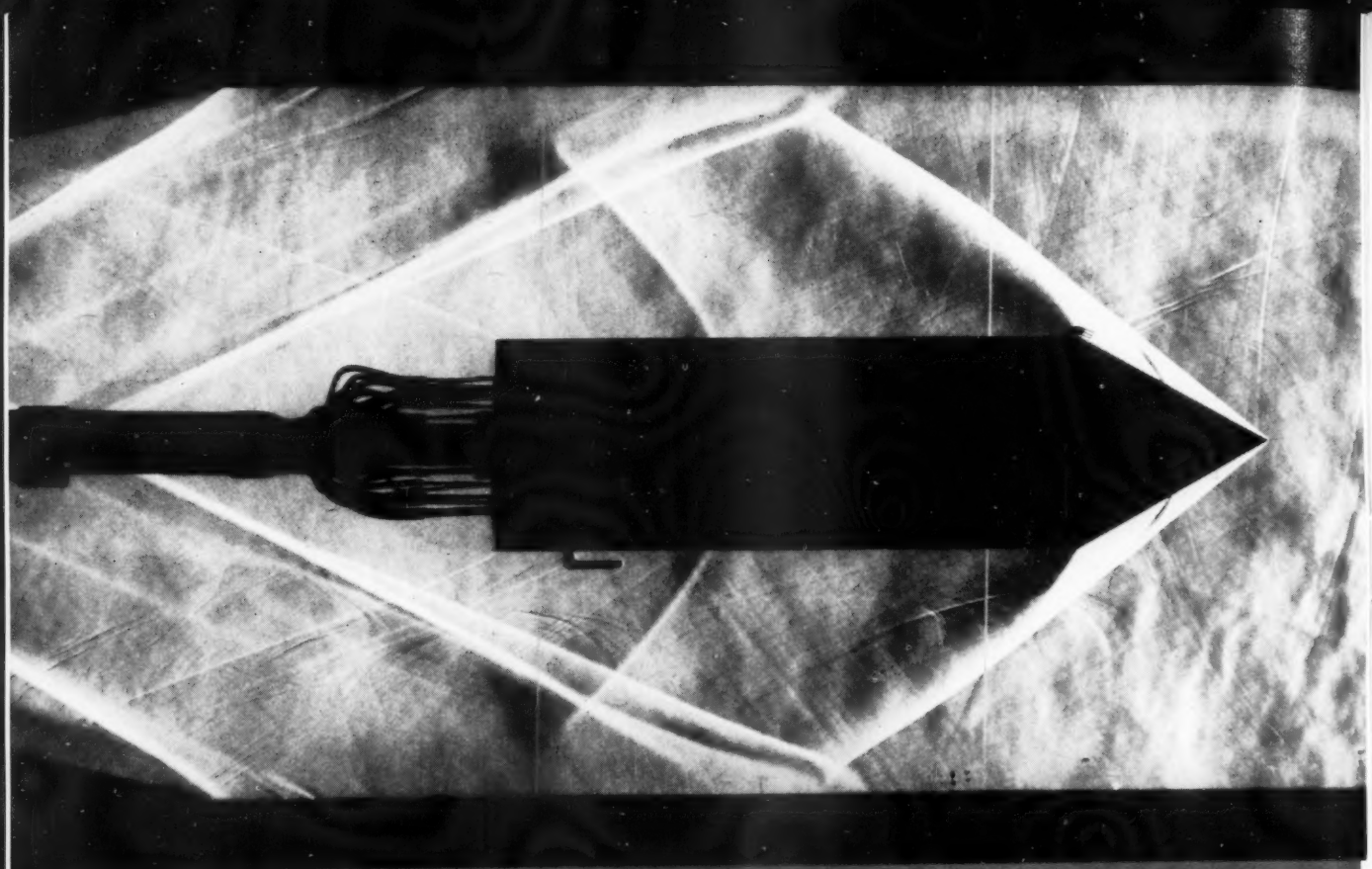


DIAGRAM B

SHADOWGRAPH

Shadowgraph technique employs a beam of light (with or without optics) from a small light source, which passes through the test area and the resultant pattern then is thrown either on a screen or film, or recorded directly on film with supplementary optics. Diagram B is a schematic representation of the system. Measurement of position of shock waves (pressure fronts) and boundary layer transition points can be accurately made. These conditions, pointed out on Diagram A, can be seen in the photo above.



Schlieren of cone cylinder at Mach No. 3.02, courtesy Supersonic Wind Tunnels Branch, Ballistic Research Laboratories.

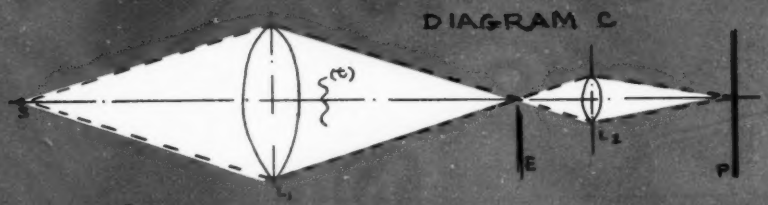
SCHLIEREN

Schlieren photography might be considered a sophisticated version of shadowgraph. With this method it is possible to measure change of pressure. The light source for this technique must also in this case be small. The introduction of a knife edge into the optical system produces the desired effect.

DIAGRAM C Light from source S picked up by lens 1_1 and imaged at point S_2. Lens 1_2 projects this image onto the screen or film. At point S_2, knife edge E is slowly introduced until the image is just obscured, but allowing a low level of illumination to fall on the screen. Close to lens 1_1 will take place the test flaw situation (t).

DIAGRAM D How does this system function? Let us consider the possible alternatives. Light passing through the disturbance area (t) in relation to our knife edge (E) will be refracted either (a) upward or (b) downward or remain (c) unobstructed.

DIAGRAM C



S—light source

1_1—lens which images source at S

1_2—lens which picks up image and projects onto screen or film (P)

E—knife edge

t—test area

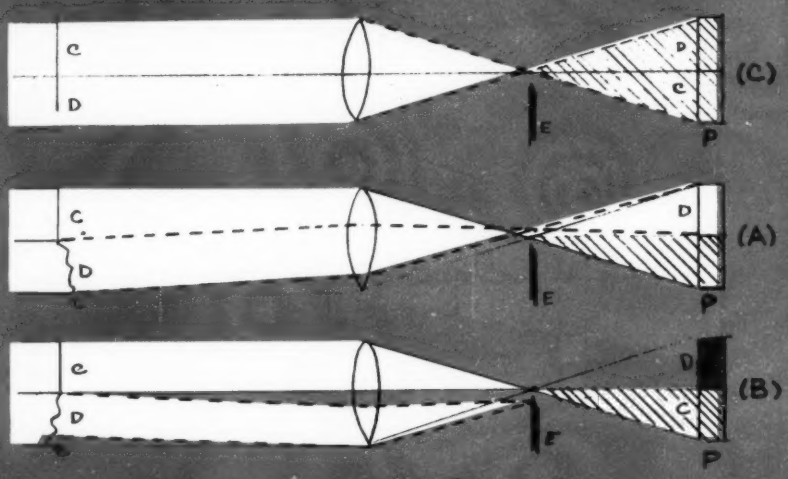


DIAGRAM D

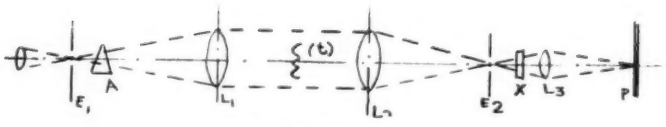


DIAGRAM E

COLOR SCHLIEREN

Color schlieren technique utilizes a small, intense, slit-shaped, white light source which is passed through a prism to disperse it into a spectrum band. The double knife edge E_2 is adjusted to permit only the green light (central portion) of the color band to pass. Density changes in air stream allow various colors to pass the knife edge E_2. Each color variation then represents a specific value of density change in the disturbance area.

S—light source

E_1—double knife edge to "firm" the rectangular source

A—prism to disperse light source into spectrum band

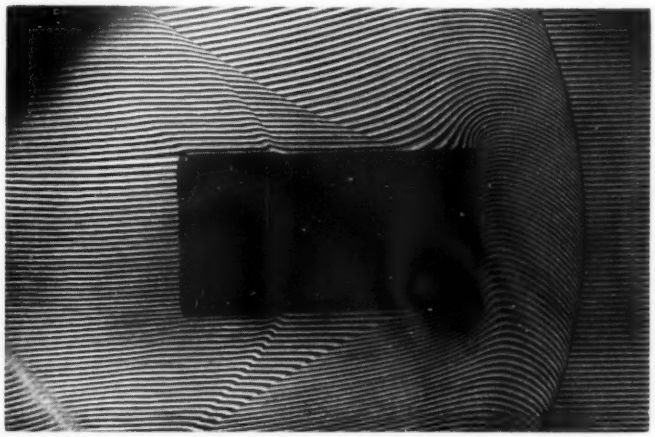
1_1 & 1_2—schlieren lenses (parabolic mirrors)

E_2—knife edge

1_3—lens to pick up image

P—film or screen

X—shutter (large enough not to cause second knife edge)



Interferogram of cylinder at Mach No. 1.45, courtesy Airflow Branch, Ballistic Research Laboratories, Aberdeen, Md.

INTERFEROMETRY

An even more sophisticated version of shadowgraph technique is interferometry, done by splitting a light source, directing it into two separate paths and finally recombining the two beams. Pairs of reflecting and beam-splitting mirrors do the job. One mirror is displaced so that the optical path of one beam of light will differ from the other by half a wave length. Alternate canceling and reinforcement of light amplitudes give a pattern of black-and-white stripes. Introducing refraction from the test object into one of the light beams displaces the symmetrical stripe pattern. Measurements of variation of rate of change of pressure are possible with interferometry, as is study of large regions of continuous, and small, variations in the densities of the disturbance area.

VARIATIONS

A modification of the schlieren system permits sharp focus on any one plane in the test area. This is accomplished with two separate light sources and corresponding knife edges.

Each source and its respective knife edge acts as its own schlieren system. The beams will superimpose only for a single plane of the disturbance. In practice it is not uncommon to have up to 50 sets of light sources and their respective edges. These sources and edges can be created on lantern slide plates by photographing an ink drawing. Setting two similar plates off register produces the desired result.

A two-flash schlieren or shadowgraph technique for studying either moving shock waves or rapidly moving objects was developed by Dr. Edgerton. The second flash is set to go off after a predetermined delay.

When photographing the detonation of a small explosive charge with this technique, it is possible to measure displacement of the two images on the photograph and calculate rate of expansion of the shock wave.

Since schlieren patterns in most cases become almost useless when we deal with low density flow patterns, another technique can be used.

Certain gases, such as nitrogen, luminesce for a period of time after they have been electrically excited. This luminescent, or afterglow phenomena, increases in intensity with an increased density of the gas. As a result, flow disturbances, by their own afterglow patterns, exhibit a pattern similar to schlieren techniques.

In practice, nitrogen from a supply tank is electrically excited. It is then drawn into the test chamber, flowed past the test object, and the resultant glow pattern is photographed.

Optics

From what has been said about schlieren photography it is apparent that light must not in the slightest way be deviated from its intended path by lens aberrations. These lenses, of the finest optical quality, must be completely free of scratches, and they must be well corrected for spherical and chromatic aberrations.

It can be seen from the quality requirements that the purchase price for a set of these lenses would be almost prohibitive. (*continued on page 85*)

Maurice Rickards'

DEADPAN DICTIONARY

Aerial Photography This is achieved by accompanying the camera to a great height and clicking it. On the whole, the operation is more hazardous than ordinary photography as it involves the use of airplanes, balloons, rockets, etc., none of which inspire the confidence felt in the average tripod. It should be remembered when photographing from the air that a falling object has an acceleration of approximately 32.17 ft. per second per second until terminal velocity is reached. The market value of any camera at terminal velocity is small. To minimize the risk, a leather strap attached to the camera and worn around the operator's neck is advisable, although in those cases where the camera is appreciably larger than the operator there are certain disadvantages. If successive pictures taken from the air are placed side by side in endless juxtaposition it becomes very difficult to walk about the room.

Angle of Incidence This is equal to the angle of reflection (which see).

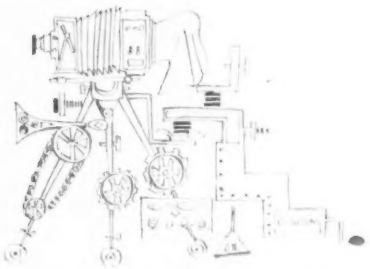
Angle of Reflection This is equal to the angle of incidence (see above).

Aperture On the simpler camera there is only one of these, but in the more advanced types there are many. In order to avoid the bother of taking out one aperture and putting in another a device has been perfected which will produce apertures of almost any size, shape or color. The larger apertures are very useful for photographing large objects, e.g. elephants, mountains, wedding groups, but for most work a middle-sized aperture will suffice. There are one or two small ones available that prevent any light from entering the camera at all, but these are very rarely used, and should be regarded as spares. Numbers are fitted to most apertures to enable the operator to distinguish one from another. If the photographer lights on a good number early, it is advisable to stick to this instead of confusing the camera with mathematical calculations beyond its reach. It should be remembered that "full aperture" on one lens might be quite a miserable affair on another, and no great faith should be placed in this expression. The letter "f" in front of the number is designed to keep away evil spirits.

Bellows This is a device for making the fire burn.

Camera Shake When a camera is not functioning properly a preliminary diagnosis—if not a cure—may be effected by holding it to the ear (in the manner of a watch) and shaking it.

Camera Stand This is a device for filling up the gap between the camera and the ground. Here again, there are many types, depending on the nature and shape of the gap. Almost all camera stands are supplied with an assortment of screws, cranks, ratchets, tilts, etc., all of which are calculated to make the business of taking a photograph easier, but longer. With the aid of a really good camera stand the studio may be made awe inspiring. Wheels of various sizes are available for the alteration of height, angle, swivel, twist and these may be operated by an impressive looking crew, the whole team being under the control of the photographer, who contrives to bring about the right relationship between camera and target before giving the order to fire.



Then there is the tripod (which was introduced by a witch in the eighteenth century). The swinging cauldron is now omitted, but the genealogy is still apparent. In order to prevent the legs of the tripod from slipping when the apparatus is used on such surfaces as ice rinks, mirrors, etc. it is possible to fit suction cups to the feet, thus making it practically impossible to move the camera to another site after the exposure has been made. Small charges of explosive in the legs will overcome this difficulty. The telescopic tripod is much used nowadays, making it possible to carry the thing in the vest pocket until the last moment, when it may be produced with a careless flourish and attached to the underside of the camera. It is advisable to extend the legs before letting go of the camera. If it is desired to photograph objects on or near the ground a small slit trench may be dug to accommodate tripod and operator thus bringing the lens of the camera appreciably nearer the subject. This technique is used for photographing things like ants, dandelions and spats.

Darkroom The darkroom may be divided into two sections. The first is used for fogging paper, and the second for fogging film. More modest darkrooms combine the two operations but this is rarely satisfactory. Having satisfied ourselves that light cannot leave the darkroom through nooks, chinks or

Ashamed to be ignorant? No need to be—just relax and laugh as this leading London lensman lifts the lid on tricky technological terms.

OF PHOTOGRAPHY

crannies—it is the crannies that are generally overlooked—we are ready to produce our first negative. The exposed film is brought into the darkroom and examined by the light of what is termed a "safe" light. On examination the film will be found to have two sides, the wrong side and the right side. Experiments have recently been made with the object of reducing this number to one, but so far the production of such materials has proved too costly for popular use. The right side of the film is the side on which has been smeared a substance which now obscures the picture. In order to get this stuff off and thus reveal the picture the film must be bathed in a liquid that makes the fingernails go brown. In order to effect this, the film is laid down, held, juggled or otherwise immersed in a dish, hand basin, jug or other receptacle. Care should be taken that the film is scrupulously clean before introducing it into the receptacle. If this is not attended to, smears, streaks, spots, etc. may appear on the fingernails instead of the regulation dark brown tint. After a time the dissolving of the chemical previously referred to will be complete and apart from the backing the film will be transparent. The backing is a comparatively recent innovation, designed to give added strength to the acetate of which the film is made. When the film is removed from the bath to the hypo this backing too will be

rendered transparent. We now find that we have a completely transparent piece of stuff about the size of a negative. In order to bring out the image it is now necessary to load up another holder and shoot the subject again, this time removing the slide.

Developing Trays Trays are used to insure that the developer is confined roughly within a certain area when it is desired to moisten the exposed paper in it. They go brown when constantly used owing to the fact that the operator's fingernails are often in contact with them, the discoloration being transmitted from this source through the developer to the tray. The staining may easily be overcome by buying a new tray.

Double Exposure This is a method often used by the photographers who are short of film. As many as five or six exposures have been made on one film, but in practice this will be found to be a false economy as the separation of the resultant images is a lengthy and costly process involving algebra, Pythagoras and pyrogallic acid.

Double Extension This sort of thing only happens on very important cameras, and is used to make the camera look much longer than it really is. It is very impressive when handled by an expert.

Dust Of all photographic subjects, this is possibly the most frequently recorded. The serious worker will have little difficulty in augmenting the already extensive documentation of this substance. Perfect pictures can be obtained under almost any conditions and the advantages of magnification in the enlarger will be obvious. In order to obtain samples of the substance for photographic purposes it is only necessary to handle a holder over a sheet of white paper for a few seconds. No further effort will be needed to insure that it appears consistently

DON CALIENTO

in negatives. Dust is available in many varieties: Common, Garden, Chemical, Glass, Gold and Star, to name but a few, although their photographic rendering is similar. It is improbable that supplies will ever become exhausted. The darkroom particularly is an apparently limitless source.

Emulsion Speeds The speed of the emulsion is generally marked on the box thus: 16, 64, etc. Simple tables are available which enable the photographer to translate these rapidly into Fahrenheit. Speeds vary greatly, ranging from Sluggish to Incredible. The faster the emulsion, the shorter the exposure. We thus find that with really fast emulsions it is hardly necessary to expose at all. In recent years great strides have been made in the speeding up of emulsions. It is now possible to photograph fast moving objects like sneezes, revolver shots, etc. There will doubtless come a time when it will also be possible to photograph light which travels at a speed of 183,000 miles per second.

Ferrotyping This is an ingenious device for sticking prints face downward on sheets of shiny metal. The process is more effective on glossy papers, it being quite impossible to remove such prints after heating.

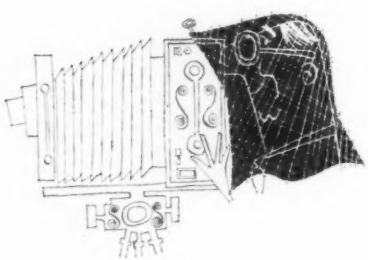
Filters Obtainable in a wide range of colors, these when stuck in front of the camera will cause a tinted

image to appear on the ground glass. Green and yellow are very popular, but the enjoyment derived from them is only transitory as the tinting is not visible on the finished print.

Flashlight This used to be a device for producing a curious smell and a fair amount of blue smoke, but this has now been superseded by a device which produces an object in every respect similar to a blown-out electric light bulb. To each of these devices is attached an average-sized flash of light. They are both alarming and require courage on the part of the operator. The general effect is similar to that of being struck by lightning. The naked report is actually deafening but being housed in the handle of the gadget it is almost inaudible. The "synchronized" flash is an ingenious arrangement wherein the flash occurs a split second after the shutter has closed.

Focal Length This means that if you move a lens between a source of light and the back of your hand you are liable to burn a hole in the back of your hand.

Focusing Cloth This most important item of equipment is vital to the photographer. It imparts a brilliant shine to the operator's shoes and also serves as a duster for lenses, equipment, etc. It is occasionally used to prevent the image on the ground glass from entering the studio. For this purpose it is worn over the head. Some very striking effects may be obtained by having the reverse side of the cloth lined in red, orange, etc. This tints the image with a pleasing rosy hue. In the summer months the focusing cloth will be found stuffy and to overcome this difficulty the tropical type may be used, the material being black cheesecloth. Alternatively it is possible to procure small cartridges of oxygen which on being inserted in specially stitched pockets in the cloth explode every hour or so. It is, however, very rare that the photographer will find it necessary to remain under the cloth for more than about three quarters of an hour except when photographing things like "The Growth of an Acorn" or "The Life of Abraham Lincoln." When not in action the cloth is worn carelessly flung over the shoulders. In this position it prevents dandruff from reaching the collar.



Focusing Device This takes various forms ranging from none at all to Critical. The none at all kind is the easiest. We should first understand what is meant by focus. This is best understood by describing out-of-focus. Out-of-focus is the technical expression for a soft image. If it is not soft it is all right. The degree of softness may be changed at will by varying the relationship between (a) the distance of the subject from the lens and (b) the distance of the lens from the back of the camera. If the image is soft it will be found helpful to vary the distance of the subject from the lens, moving it (or her) backward and forward through ever diminishing distances until the mushy appearance is removed. The image is now Critical. Many cameras overcome this difficulty by providing a device for moving the lens away from or nearer to the back of the camera. This is most ingenious and involves knobs and ratchets, and a kind of telescope thing to insure that the front and the back of the camera remain connected with each other. This is important because without such a device there would be nothing to screw the lens into.

Guides to Photography As the photographer learns chiefly by mistakes, it may be assumed that writers of guide books have made rather more than the average number of mistakes, and therefore know much more than the photographer who has only made some of the less ambitious ones. Some extremely complicated mistakes are possible, and the beginner is advised to attempt these only when he has become a master of the simpler kinds. It is unwise to be too precipitate in this matter, although even amateurs who discover really original mistakes and who have a literary bent may well become famous as writers of guide books.

Guillotine This is similar to the trimmer, except that it is used for cutting off people's heads.

Knifing This is a method of removing unsightly pimples, lines, freckles, etc. in portraiture. The offending areas are lightly scraped with the blade of a knife specially made for this purpose until they are uniform with the rest of the surface. It is an extremely delicate process requiring years of experience, and beginners are advised to practice on prints, negatives, etc. before starting on actual sitters.

Lensboard A piece of wood with a hole in the center which is attached to the lens. It is used to insure that the camera remains connected to the lens, and also to support the maker's name plate.

Leveling Device This frequently takes the form of a red glass piece on the top of the camera, or, more occasionally, a lump of metal loosely attached to the fuselage pointing earthward. The red glass piece is the more fascinating contrivance as it contains a small quantity of liquid in which rests a blob of air. When the blob of air rises to the surface of the liquid the camera may be assumed to be ready for use. When the blob falls to the bottom of the liquid the camera is upside down. The camera should rarely be upside down, although this may assist the novice in seeing the image right side up on the ground glass. This is not really playing the game, however, and most professionals school themselves to avoid this form of cheating. The lump of metal pointing earthward indicates to the operator roughly where the earth is. This enables him to form an idea of the position of the horizon. It is important in photographing things like horizons.

Mirror This only happens in one or two types of camera and is a device which insures that at the moment of exposure the operator is prevented from seeing what is go-

ing on in front of the camera. It is very treacherous and may result in only half a picture and/or seven years bad luck.

Mounting A process where, by the attaching of a piece of card to the back of the photograph, the charge made to the purchaser is tripled, and a light-hearted curl or cockle is imparted to the card. There are various methods of producing this double effect, all of which may be relied upon to curl even the most recalcitrant mount. With the addition of a decorative pencil line, the signature of the photographer (all preferably on the same side of the mount as the print) the work is complete. Mounts may be of any color, ranging from cream, light cream, through the spectrum to off-white, buff, dark cream. Curly mounts if placed beneath a copy of Webster's International Dictionary for six weeks will be found at the end of that time to be quite free of dust. It is unwise to make a molehill out of a mounting.

Parallax Medical aid should be sought.

Partial Reversion This is what happens when the negative is partially reversed. It is sometimes called solarization, but it is really quite simple, and happens when the negative is partially reversed.

Photographs Do Not Bend Wishful thinking on the part of photographers everywhere. They do bend.

Proportion This means that if a negative measures 2¼ x 3¼ in., when it is placed in the enlarger the image will be a good deal bigger. There are mechanical and mathematical means of arriving at the same conclusion, but to most photographers the proposition requires practical demonstration.

Proportion, Sense of Not encountered in photography.

Register This means that if the camera had been properly made the plane occupied by the ground glass would be the same as the plane occupied by the film if you had remembered to load the holder. Register very rarely happens.

Rising Front This makes the front rise. It is used in photographing things like steeples, telegraph poles and chimney stacks. The chief disadvantage in a rising front is its tendency to fall suddenly. This can be overcome by pushing pieces of matchstick or folded paper between the rise and the front.

Safe Light This, as its name implies, is a lamp too near to which it is dangerous to bring sensitive material. The wrong kind of safe light may be bought very cheaply from any photographic dealer, and will cast a pleasing glow over darkroom proceedings. It is not advisable to use a lamp of over 500 watts in conjunction with the safelight, as this is inclined to dazzle the operator.

Samples Pictures so far above the usual quality of the photographer's work that they surprise even the photographer himself. Samples very rarely happen.

Sepia Toning A very smelly process. Happily, dying out.

Shutter This, as its name implies, is a shutter. It is a thing that opens in front of the lens. It can be operated by a sort of lever on the side of the camera, or by a long piece of rubber tubing with a bulb on the end, or by a thin black thing with an in-and-out thing on the end. The shutter should also close again after the exposure. If the cable or rubber tubing is knotted or trodden on during exposure it is likely to lose its closing action, and will result in what is termed Over Exposure. Another way of dealing with the whole problem of exposure is to place a hat or some other article of clothing in front of the lens and remove this when it is desired to expose. The danger here is that suspenders, etc. are inclined to become entangled with the camera at the moment of removal and this is very hard on the garment. If the hat is used it is best to make certain that the label inside is of sober design, as the lettering, etc. may be visible on the finished photograph. Yet another method of exposure much favored by those who have no shutter is to switch off all the lights in the studio, remove the slide, and suddenly switch on the lights, leaving them on for roughly two or three seconds; switching them off again when it is felt that the camera has had enough. This method takes the camera completely by surprise, and involves no levers, buttons or other devices. Care should be taken that in going to and from the camera in the dark no articles of equipment, electric cables, etc. are allowed to cross the path of the operator. It has been found advisable to screw down furniture before using this method.

Soft Focus Attachment Used in enlarging to introduce mush when this has not been achieved in focusing. Similar effects may be produced by printing through satin, Brussels lace, steam baths or the *Congressional Record*.

Speedlight A device whereby electricity is tortured into unaccustomed shapes and sizes within a box weighing about 14 lbs. When the agony has reached an intolerable point the electricity escapes from a specially prepared exit. A bright light accompanies the escape. This is used in photography. The bright light is of very short duration, but unusually fierce. This enables us to record the surprisingly unattractive facial grimaces that people make during normal conversation.

Spherical Aberration The average photographer is not likely to have any of this.

Swinging Back This is what happens when the camera is suspended from the ceiling by a piece of string. If the operator advances too far forward with the apparatus he will become momentarily air borne. He will then swing back.

Triple Extension This is much the same as the double sort, only more so.

Uprights In photographing architecture, for example where uprights have a tendency to be upright, it is desirable to reproduce this tendency in the picture. This is impossible. Efforts have been made to tilt the top of the building forward by jacking it up from the rear, but the photographer should not attempt this without the assistance of the builder. An alternative is to utilize the rising front (see Rising Front) or to correct the distortion in the enlarger by tilting practically everything. This method will put at least two stories on any building.

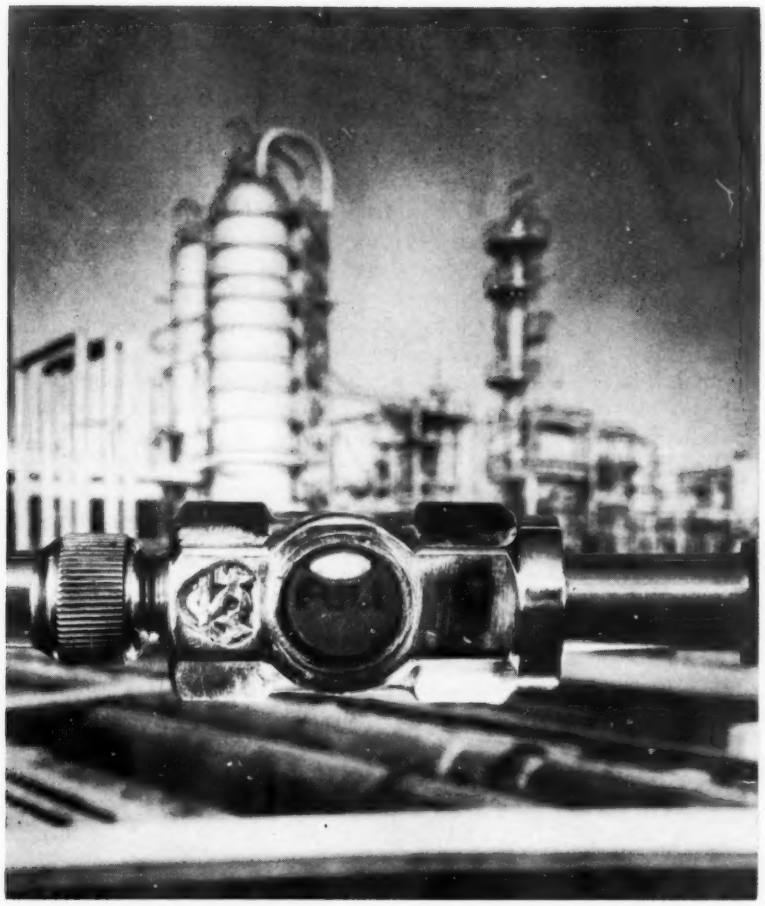
Zygophyllaceae The serious photographer is unlikely to be worried much with this kind of thing.

Materials for testing cellulose fiber made tricky exposure problem as well as intricate job of arranging. Laboratory where the picture was made was brilliantly illuminated by fluorescent light. Subject was organized on background paper and basic exposure was by room light, followed by very brief shot of electronic flash to put the sparkle into the highlights.

Masking off the clutter in the background with grey paper was only the first step in organizing this shot of a craftsman working on famous Steuben glass. The rack of cutting tools at right had to be moved into the picture. Lighting was as simple as possible: one diffused spot high and to the left, to bring out the decoration on the glass and just enough of the surrounding area for atmosphere. Unessential areas were left dark.

"BREAD AND BUTTER" HOW TO DRESS IT UP

The industrial photographer is always in danger of being bored to death by an endless succession of small objects to picture. Falling into dull routine on these assignments is fatal. Here past master Victor Keppler, in an interview, drops a few hints as to how to make them look their best.



Refinery scene below was used as the background for gauge only 2 in. long. Print was lit as though for copy negative, but light on it aimed low for dark sky effect. Focus was on gauge, and background allowed to go soft. Gauge presented tricky lighting problem for it had to be illuminated from back to show FULL marking behind ruby glass window. Spot on hidden tiny tilted cardboard disc reflector did trick. Highlights were spotlit, and evenness of illumination achieved by front flood with spunglass diffusion screen.

Curly piece of background paper, key light, fill-in, *click*, next subject—oops! hold onto that wad of chewing gum: it's what holds the subjects in place! The standard procedure is so automatic to any experienced photographer that he could turn out at least an average example of nuts-and-bolts hackwork while suffering from snow-blindness, unrequited love, or even a New Year's Eve hangover.

Nevertheless the proper presentation of the small object is perhaps the most important slice of the work of the in-plant man, and instead of being as weary of it as he generally is, I believe he could make his studio life more interesting by making every assignment count; dressing up the subjects until they look every bit as important as they no doubt are to the men who make and sell them.

The first requirement—more often than not overlooked by the bored photographer—is to find out what the devil the part is. Just reading the stockroom tag is usually insufficient. It doesn't dramatize a piece of metal any to learn that its full name is 121/GV/3407/.06. Where does it fit in the general product picture? What does this particular photograph have to emphasize? Given the answer to those two questions and a little imagination, a far greater proportion of the small-object photographs in circulation today would escape from the run of the mill category.

Looked at photographically, the picturing of small objects can be just as much a technical challenge as the documentation of a giant piece of equipment, and, in fact a pretty good case might be made out for their being even more of an opportunity for the photographer to show his skill and resourcefulness.

Aside from the primary and overall recommendation to know what he's doing, there are a few other general principles I would like to put on the record. The most important one—at least I have found it important—is to keep the number of light sources down to a minimum. If you can get away with one light source and a bounce, so much the

better. Of course the job that can be done with this rock bottom equipment inventory doesn't turn up every day, but as a working hint nine lights are better than ten, eight better than nine, and so on to the one-light-and-bounce setup, which is the best of them all.

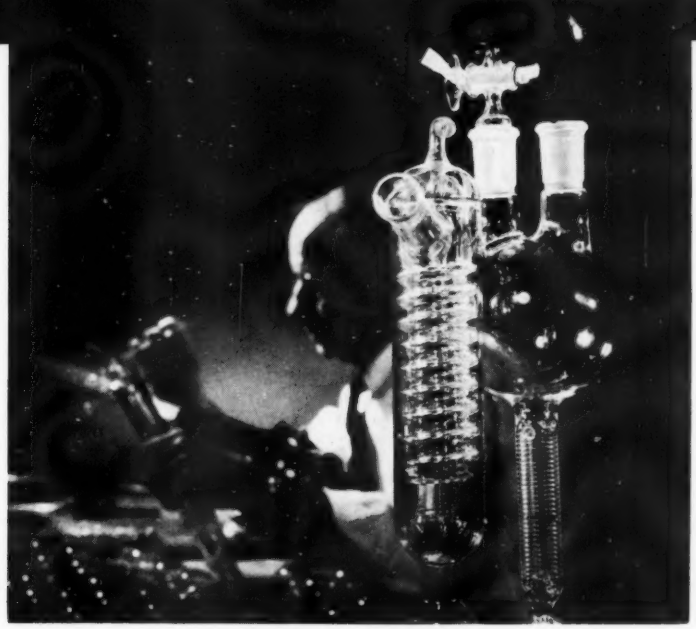
It is not only for ease of transport that the less lights the better is a good working principle—although anyone who has ever lugged more lights to a job than he wound up needing knows that under certain circumstances it can be very inconvenient. The real advantage in keeping lighting simple lies in the improvement this generally makes in the pictures that result. The more light you pile up on one area of the picture, the deeper shadow you're digging for yourself somewhere else. Even this isn't the worst of it. Cross-shadows can confuse a picture to the point of uselessness. You can get a lot of bad pictures with a single light source, but they won't be bad becasue of cross shadows.

Although it is standard practice with color, few photographers bother to make three exposures on a black-and-white job. I always do; one at the normal setting, and one each ½ stop either side of it. Occasionally some very pleasing effects come out of this. On subjects which I suspect may yield a good high-key shot I sometimes open up as much as two stops above normal.

Of course, the use that will ultimately be made of the picture is a determining factor, but more attention might profitably be paid to backgrounds. Most small products are generally shown as though suspended in mid-air, which I suppose is all right as far as it goes, but before taking this easy way the photographer ought to ask himself whether it really goes far enough.

There are times when the blank background is absolutely necessary, but they are not as frequent

Background for airport light was secured after twilight vigil at busy runway. Lights in scene were emphasized by drilling through them and illuminating from rear. Rest of job was fairly straightforward low-key picture except that light in subject was insufficient to show up dramatically in picture. Original bulb had to be replaced with flood.



Two pictures in one made this striking study of Corning Glass technician fashioning laboratory ware. To bring out background values yet keep them sufficiently subdued, man had to be lighted as though for portrait. Glassware was brought forward on table and given hard front light for brilliance. Soft background set it off.

Reflecting surfaces trimmed with transparent plastic posed rough lighting problem, for dulling spray would have killed sparkle. Keppler solved this with screened front light as main source, modeling with spot bounced from matte cardboard hung over faucets. Sometimes he cuts card to particular shape for just the right bounce. ▼

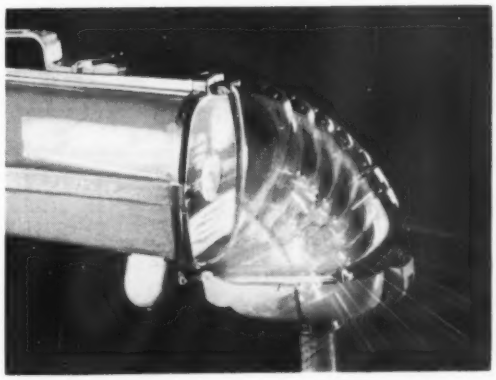
as the occasions when a little extra work would result in a very much more interesting picture. Interesting not only to the man who sees it, but—I am tempted to say more important—to the man who makes it. It is very seldom that a bored photographer can turn out a good picture. One of the best ways to keep from getting bored with bread-and-butter photography is to refuse to give in to it. If every job is viewed as an opportunity for doing something brilliant, the whole dreary concept of "bread-and-butter work" loses its meaning. It can still provide the photographer's daily fare, but at least the bread and butter will have a little jam on it. And the pictures will be better.

The pictures with this article were selected not because I think they are the really right way to go about photographing small objects—there is no one "right" way to do anything in photography—but because they illustrate points I've been making. Each of the objects pictured could have been photographed by itself, unrelated to its function and with its real importance underplayed. (I'm not saying that this would have satisfied the client—it wouldn't!) But it was more interesting to me to make good pictures instead of mediocre ones.

In none of these pictures, by the way, have I gone dramatic to the point where the viewer would have to ask what has been photographed. There is a point between flat presentation and over-dramatization, at which the subject of the picture and the atmosphere surrounding it strike a balance. It is this point of "dressing up" a subject that I try to reach on every job.

There is no easier way than by bearing two rules in mind: keep the lighting simple, and be interested—really 100 per cent interested and totally absorbed in the job at hand.—THE END

Two speedflash systems were used for this job; 3 on body of vacuum cleaner and two repetitive on hinged front section. Broomstick was used to push section closed. It was later airbrushed out.



GRAPHIC FAILURES

Photographic theory is fine. But when it comes to practice, there are deviations from the "laws" and recondite variables that throw workers in the best regulated plants. What's more, the errors these mysterious gremlins cause are likely to be cumulative. Herbert P. Paschel points out how acute they can be, especially in reproduction.

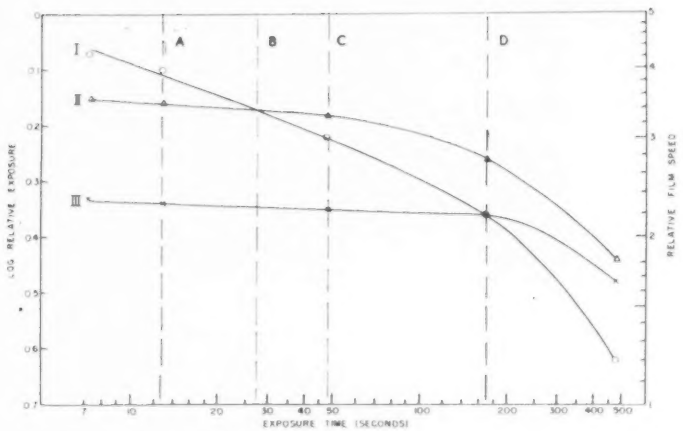


FIGURE 1. SOURCE—TAGA PROCEEDINGS 1956, PAGE 71.
Reciprocity behavior of typical orthochromatic litho films according to the investigations of R. Alfaya.

Test Condition	A	B	C	D
Illumination Intensity	100%	48%	27%	7.5%
Exposure Ratio To Preceding Condition		2.07x	1.77x	3.60x

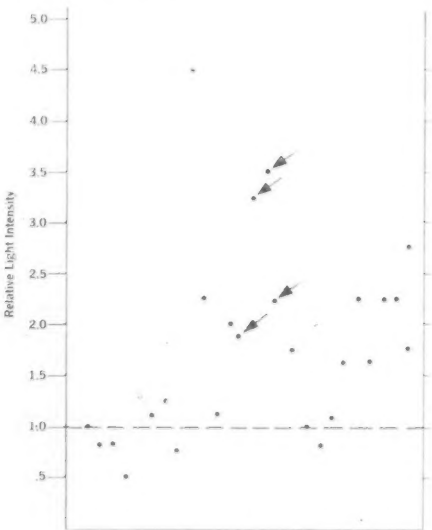
FIGURE 2. SOURCE—AUTHOR.
Illumination relationship and normal exposure ratio at which reciprocity failure can occur with certain litho films. (Calculated from the data of Figure 1.)

The behavior of photographic materials, we are told, follows very definite patterns. Varying exposure time and lens apertures in accordance with the illumination level and the film speed, and increasing or shortening development for contrast adjustment, in most cases compensate for the average difference in conditions. Yet it very often happens that a photographer will find himself in a puzzling predicament that seems to defy both previous experience and accepted theory, the reasons for which often remain obscure. This is particularly true of graphic arts photography.

Among the enigmas faced by graphic arts cameramen are the following:

a) Inability to carry over proven techniques from one plant to another when changing jobs.
b) Difficulty in establishing standard and uniform techniques for all cameras doing equal work within one plant.
c) Variable results not attributable to errors in judgment, timing or processing.
d) Apparent shift in the speed of one film, or shifts in speed among several films of different brand with changes in the exposure conditions.
e) Variations in filter factors or shifts in spectral response.
f) Wide divergence between film manufacturer's recommendations and practical techniques.
g) Situations where it is impossible to obtain useable results despite application of sound and proven methods.

In all of the above the human element can be ruled out since ex-



perience has shown that the difficulties under consideration are in no way related to the lack of competence on the part of the operator. Possible explanations must be sought elsewhere—particularly in the performance of the materials and equipment used.

Reciprocity failure

That photographic emulsions do not respond to extreme exposure conditions according to the reciprocity formula E=It has long been known. On the average, reciprocity failure, i.e., the exceptions to the validity of the reciprocity law, is seldom experienced with continuous tone, black-and-white emulsions when the lighting conditions are such that exposures range from 1 sec. to 1/1000 sec. With the increasing use of high intensity, short duration flash illuminants, available light techniques and color films, reciprocity failure has become a common experience to an ever widening group of professional and amateur photographers. Today, to minimize the problem, emulsions are marketed with specific response characteristics for the exposure conditions under which they will be used. Likewise, multiple exposure indexes, adjusted for varying exposure conditions are published for many films.

Few cameramen, however, are apt to consider that reciprocity failure might occur when exposure conditions vary by as little as a factor of 2X. But this may actually be the case with the slow-speed, high-contrast films used in line and halftone photography.

As fantastic as it may seem, slight changes such as the use of smaller or larger lens openings, or moving the lights closer to or further away from the copyboard could result in an exposure error due to a shift in the exposure index of the film. This is a common experience with litho type films due to reciprocity failure.

The investigations of R. Alfaya (1) pinpoint the reasons for this perplexing condition. Figure 1 shows the reciprocity behavior of three widely used litho films. At exposure condition A, film 1 is slightly faster than film 2, while both are faster than emulsion No. 3. At exposure condition B the light is half that at A. Films 1 and 2 now respond with the same speed. A reversal in film speeds (from that at A) takes place at condition C, where film 2 is faster than film 1. At D, films 1 and 3 respond equally, both being slower than film 2. Film 3, it will be noted, maintains a fairly uniform exposure response throughout.

According to Figure 2, the illumination level difference between the test conditions A and D is in the order of 13:1. But between any two adjacent points the maximum difference does not exceed 4:1 (C and D), while the minimum variation is 1.77:1 (B and C). As will be seen, this is well within the range of average camera variations found in the industry.

Illumination Variables

The reciprocity behavior of litho films is, of course, an inherent quality of the respective emulsions. The disturbing effects of reciprocity failure are due mainly to variations in the exposure conditions. The latter, in turn, may be due to any one or more of the following:

a) inherent differences in the intensity of the light sources.
b) inherent differences in the light transmission of the optical systems.
c) differences in the aperture systems used by the cameramen.

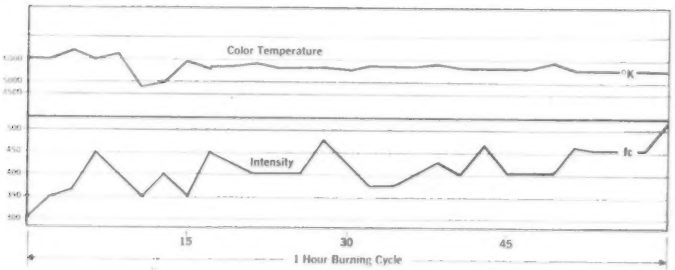
In a limited survey made by this writer the intensity of camera light sources varied by as much as 10:1, the majority of cases (about 75 per cent) falling into a range of about 4:1. Figure 3 illustrates the illumination levels found in thirteen representative plants. The points marked with arrows indicate the four different illumination levels on the four cameras in one plant. The extremes, in this case, represent an illumination difference of about 2:1. Obviously, reciprocity failure would preclude establishing uniform exposure techniques among the four cameras in this one shop, all other conditions being equal.

Fluctuations in illuminant output introduce exposure errors that are not directly caused by reciprocity failure. However, because reciprocity failure does occur within such narrow exposure limits, the exposure errors are likely to be more severe than can be attributed to light variation alone. Thus, exposure adjustments based on the measured or metered light differences are not likely to fully compensate for the error introduced by the difference in light strength.

The problem is further complicated by the fact that intensity fluctuations are accompanied, in the case

◄ FIGURE 3. SOURCE—AUTHOR.
Variations in camera illumination levels as found in thirteen representative graphic arts plants.

FIGURE 4. SOURCE—AUTHOR.
Fluctuations in the intensity and color temperature of an arc lamp during production use.



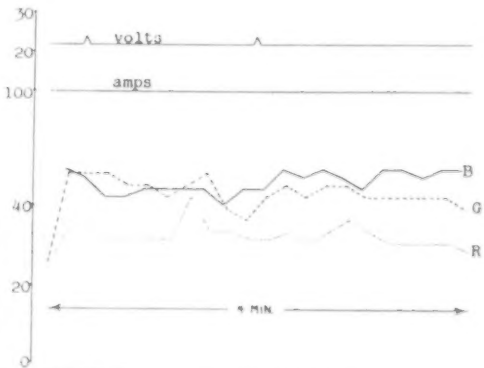


FIGURE 5. SOURCE—TAGA PROCEEDINGS 1957, ILL. NO. 1, PAGE 175.
Variations in the intensity and color content of the light produced by an arc lamp despite steady voltage and current.

of incandescent sources, by variations in the spectral composition of the light (color temperature). Exposure errors, in such cases are a complex combination of a loss or gain in light intensity, a change in effective film speed and a shift in spectral response.

The curves of Figure 4 show the fluctuations in both intensity and color of an arc lamp in production use during an hour's operation. Color temperature readings were taken with a meter which measured the red-blue ratio of the light. While this does not give a true indication of the total change in spectral composition, it does show when a shift in color balance occurs. A study of the data reveals two significant variations for this particular lamp. First, at the start of the period the light intensity was low but gradually rose to a higher level. Second, while the average color temperature was within reasonable tolerances most of the time there were brief periods when the shift exceeded 1000° K. In a second test the same light started out at a high level and gradually waned to a lower level in intensity. Subsequent tests revealed that this lamp had an inherent tendency to vary in intensity from exposure to exposure as well as to increase or decrease in light output during an exposure. The exposure errors experienced in line, halftone and color separation work could be attributed directly to erratic lamp performance alone in some cases.

A more critical study of arc lamp performance by Norman and Rhodes (2) revealed that even with constant arc voltage and current serious inconsistencies were observed in practice, Figure 5. Despite a uniform power input, the light generated varied considerably in both intensity and color content. Another lamp, Figure 6, which was operated under extremely erratic power conditions showed hardly any greater fluctuation in light output. Some lamps were found to stabilize after a warm-up period while others showed no tendency to stabilize at all.

The variables in arc lamp operation from day to day, from exposure to exposure, and from plant to plant, make it very unlikely that a reproducible pattern of exposures could be established for exacting reproduction work.

Optical Variables

While they are contributing factors to varying exposure conditions, differences in the light transmission of process lenses of the same type and make are generally not of sufficient magnitude to be solely responsible for bringing the reciprocity characteristics of the film into play. Exceptions might be very old lenses with tarnished and clouded surfaces and discolored cement. On the other hand, optical systems involving prisms or multiple mirror image reversing systems in addition to the lens have considerably higher light losses. The difference in light transmission between a camera so equipped and a lens-only camera might reach a factor of 2:1. Thus, even though the two cameras have the same light intensity on the copyboard, the actual light level of the images would be unequal enough to cause exposure differences and introduce the reciprocity factor.

Of even greater significance to exposure problems and image quality are the reproduction characteristics of process lenses. Variations in lens performance is far more serious than is generally suspected and is the direct cause of many of the troublesome and puzzling situations encountered in the industry. Figure 7 illustrates the characteristics of four lenses in use in one large lithographic plant. Measurement of grey scale densities on the ground glass of all four cameras revealed substantial differences in the projected images. The test data indicates increasingly lowered image contrast from cameras No. 1 to No. 4, and demonstrates the reason for quality differences among the four cameras and the inability to establish uniform exposure and processing techniques. The compensations employed in practice in respect to exposure and processing were in accordance with these findings. The image degradation of Camera No. 4 was so serious that normal compensations were inadequate to overcome the optical contrast loss. Time-gamma curves, Figure 8, plotted from practical tests conducted on Cameras No. 1 and No. 4, show that the inherent low reproduction characteristics of the optics on Camera No. 4 lower image contrast to such an extent that it is virtually impossible, or impractical, to match the negative quality of Camera No.

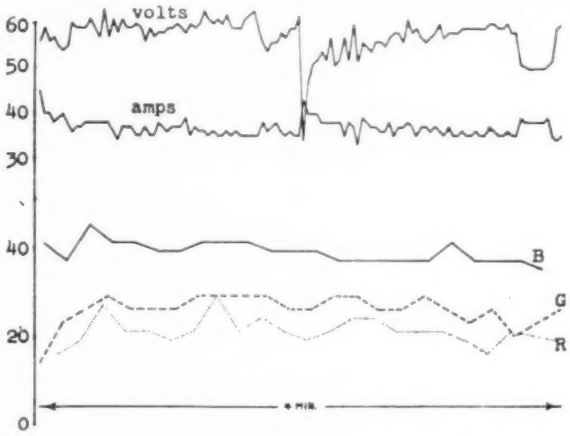


FIGURE 6. SOURCE—TAGA PROCEEDINGS 1957, ILL. NO. 3, PAGE 176.
"With fluctuations in voltage and current the light produced by an arc lamp varies in all respects as expected. Surprisingly, the variations were no more severe than those observed for the lamp operated under steady power input."

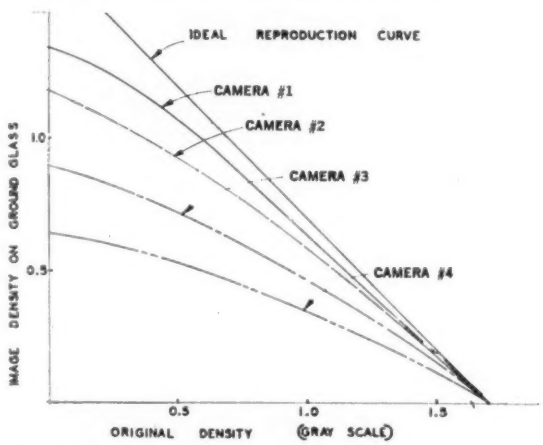


FIGURE 7. SOURCE—AUTHOR.
Reproduction characteristics of four process lenses in use in one lithographic plant. The negative quality produced by lens No. 4 was virtually useless; even greatly extended development would not rescue them.

1. The characteristic curves of the test scale likewise show abnormal tone relationships created by the defective lens for which there is no adequate compensation.

Of all the factors which influence lens performance, flare is the most troublesome. In this discussion flare refers to the unwanted light spread over the image regardless of whether it emanates from the subject and is scattered by multiple reflections from the lens surfaces, or is extraneous light which enters the optical path directly or by reflection.

Basically, flare reduces image contrast and thereby necessitates compensation in exposure and development. Flare, however, is variable and thus a standard compensating technique is impossible. Moreover, compensating for flare does not result in negatives of equal characteristics, Figure 9. The degree of flare and its effect on the results will vary from exposure to exposure in accordance with the nature of the copy, the focus, the apertures used, etc. This obviously sets up a series of variables which defy analysis by the cameraman and which cannot actually be overcome. In an almost futile effort to minimize the effects of flare the exposure conditions are varied. This may introduce the factor of the reciprocity behavior of the film in the case of line and halftone work and thus further complicate an already complicated problem.

Conclusions

The line, halftone and continuous tone separation images required in the graphic arts must meet very exacting standards. It follows that the operating conditions must meet equally exacting standards. The reciprocity behavior of litho films and the discrepancies in the performance of illuminants and lenses have been shown to produce extremely unstable and non-uniform operating conditions in graphic arts photography. These variables, acting singly or in combination, are the basic causes for most of the camera problems existing in the industry today. Some plants, unknowingly operating sub-standard camera equipment, are unable to match the quality or production costs of their competitors. Automation in color reproduction, which will make even more exacting demands, can hardly be introduced successfully under existing conditions in the camera departments of the industry.

What can be done

Since compensatory techniques are neither reliable nor adequate, the ultimate solution lies in establishing uniform operating conditions at the highest level. All cameras in a plant doing equal work should be as closely matched as possible in respect to the reproduction characteristics of the optics, strength and uniformity of the illuminants, and the materials used. And the same high standard should prevail throughout the industry.

Cameramen would do well to verify the performance of their present equipment. Lenses can be checked by measuring image densities on the ground glass and by the flare tests proposed by J.A.C. Yule (3). Simple checks on the output of the illuminants can be made using light meters and color temperature meters. The data thus revealed may explain various operating difficulties or justify condemning and replacing equipment.

In changing jobs, cameramen should not expect to carry over their previously satisfactory exposure and processing techniques.

Employers, on the other hand, should be cognizant of differences in operating conditions and give new personnel adequate time to adjust to the prevailing conditions.

In the face of the variables described, perseverance is no virtue. If at first you don't succeed, don't just try and try again. Better find out quick if what you want to do is within the realm of possibility.

—THE END

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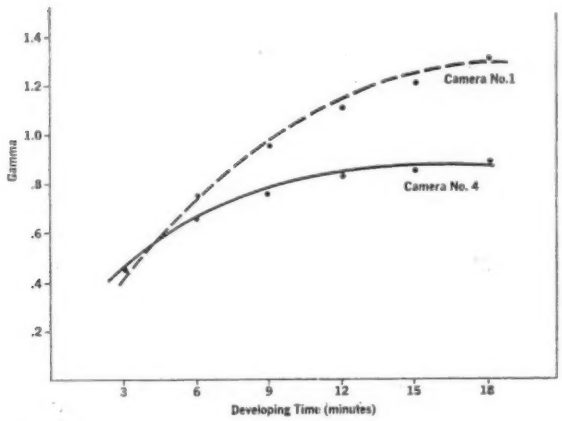


FIGURE 8. SOURCE—AUTHOR.
Time-gamma curves of grey scale tests made on cameras No. 1 and No. 4 (Figure 7) show how flare in a lens suppresses image contrast to the point that it cannot be restored by extended development.

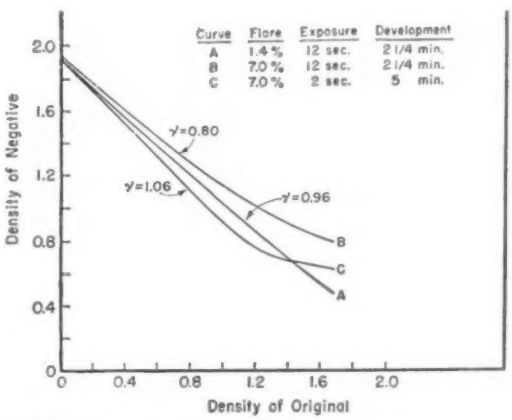
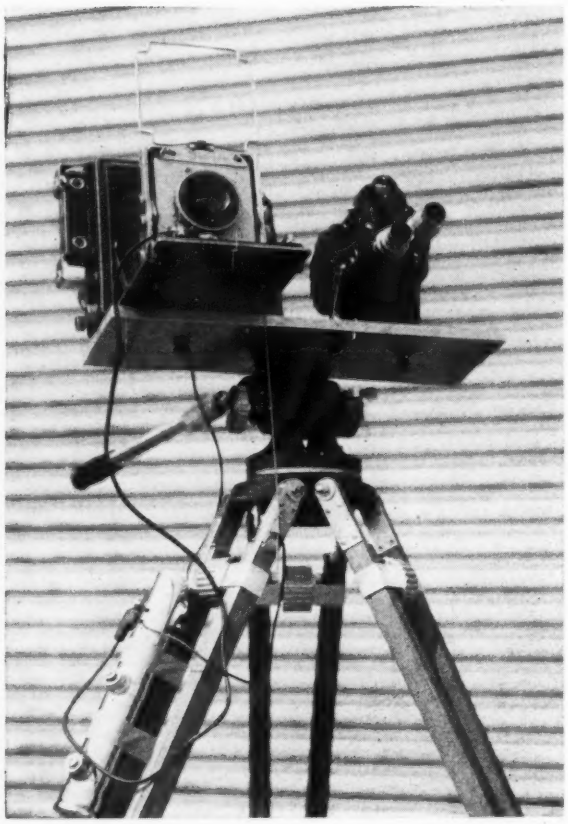


FIGURE 9. SOURCE—TAGA PROCEEDINGS 1949, YULE. LENS FLARE, FIG. 1.
"The effect of flare on continuous-tone negatives. Tone distortions are introduced both by the flare and the compensatory techniques." Courtesy Eastman Kodak Company.

PHOTO DEPARTMENT ANALYSIS NO. 8

SHULTZ'S PROGRESS

It took a year for this one-man-band photo department to get from a desk drawer, via the men's room, to a well equipped darkroom, but Bob Shultz, of Los Angeles, enjoys working single-handed.



Tandem timesaver: This trick baseplate was designed by the Aerophysics Development Corp. for Schultz. It allows the photographer to shoot both stills and movies at the same time. Both cameras are lined up on the subject, the battery case taped to tripod leg, and one side of the remote cord is cut and secured to the baseplate. Second runs from battery case to contact on thin wire "wiper," shown. When wiper hits baseplate, shutter is tripped by closing of the circuit to solenoid through the battery case. Point of action must be chosen beforehand.

Bob Shultz is the one-man photo department of the Los Angeles Engineering Section of the Aeronautical Division of the Minneapolis-Honeywell Regulator Company. The Los Angeles Aeronautical Division was established in 1955, and Shultz was hired as a full time photographer in February 1957. He created his job.

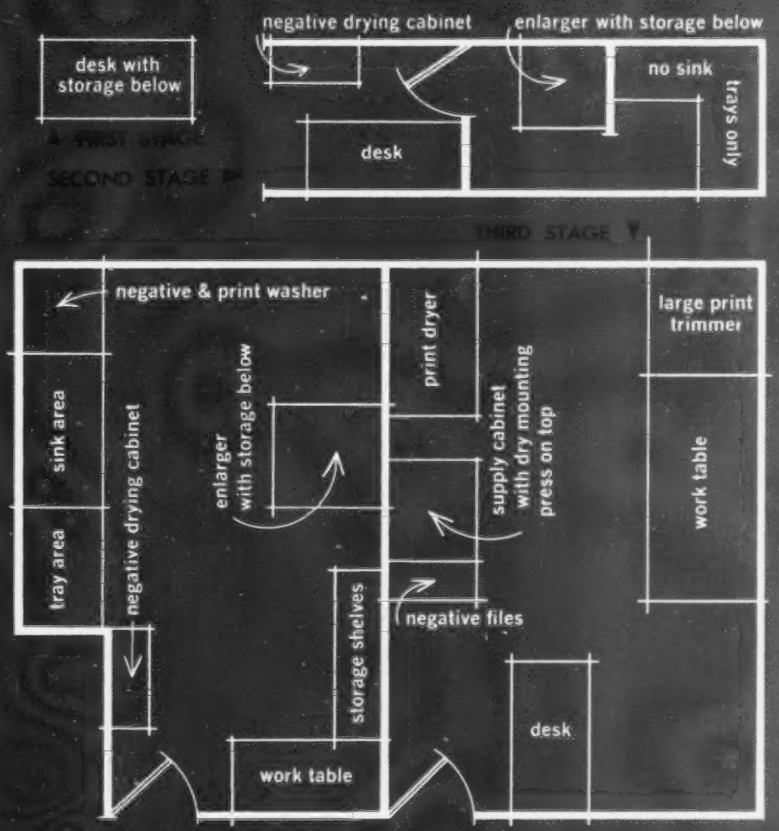
"At the beginning my facilities left something to be desired," says Shultz, "namely—facilities!" I was given a desk with storage space below—period. No darkroom, not even equipment. I used my own cameras and accessories. At that time I had a 4 x 5 Meridian camera, a 16mm Victor motion picture camera with two lenses, a Rolleiflex, a Polaroid Land Camera, an Eastman Master II View Camera, an editing board with a splicer, a viewer for 16mm films, one speedlight, several tripods, a few photofloods and two 35mm cameras. During this period I did nothing but shooting both stills and movies, and a certain amount of editing. All processing was farmed out to custom processors. We were lucky to be within reach of some very good outfits, who took pains and care with the processing and, on the whole, the service we got from outside labs was very good. I am very thankful to these labs since they were large custom houses and the amount of work we sent them certainly was handled with courtesy and care completely out of proportion to the dollar volume involved for them."

Shultz explains that a great deal of his time was eaten up with delivery, pick-up runs and consultation with the lab people; time which he felt he could employ much more profitably were he to do his own processing right at the plant. He finally proved to the company that he actually spent as much time on the road as he did shooting.

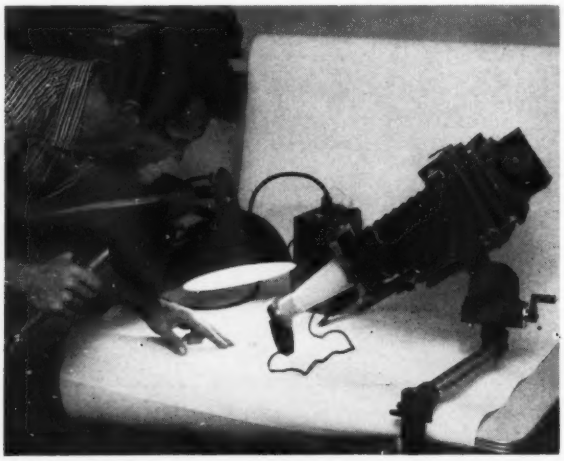
This state of affairs—and Shultz's constant hammering home of the point—brought about the ac-

THREE-STAGE SUCCESS SAGA

Beginning with just a desk and drawers for storage space, the rise of Bob Shultz can be measured in square feet. Next stage was a two-compartment ex-closet without running water, so Shultz was forced to use facilities of men's room for other purposes than for which they were intended. Present layout is comparatively palatial, and permitted photographer to give up use of outside processors. Variety of equipment above gives some idea of variety of photographic jobs Shultz is ready to tackle single handed. Unpredictability of assignments keeps him fit both physically and photographically. He likes it.



Macrophotography is made easy with this ring light outlit made in plant. Steel cone and lensboard steady camera as well as bring lens and ring light forward.



As bellows is extended for magnification, ring light automatically approaches subject, counteracting need for large f-stops. White cone reflects heat of floods.

To examine soldered joint a scant eighth of an inch across, engineers requested this macrophotograph. It is only one of odd assignments Shultz gets continually.

PHOTO DEPARTMENT ANALYSIS NO. 8 *(continued)*

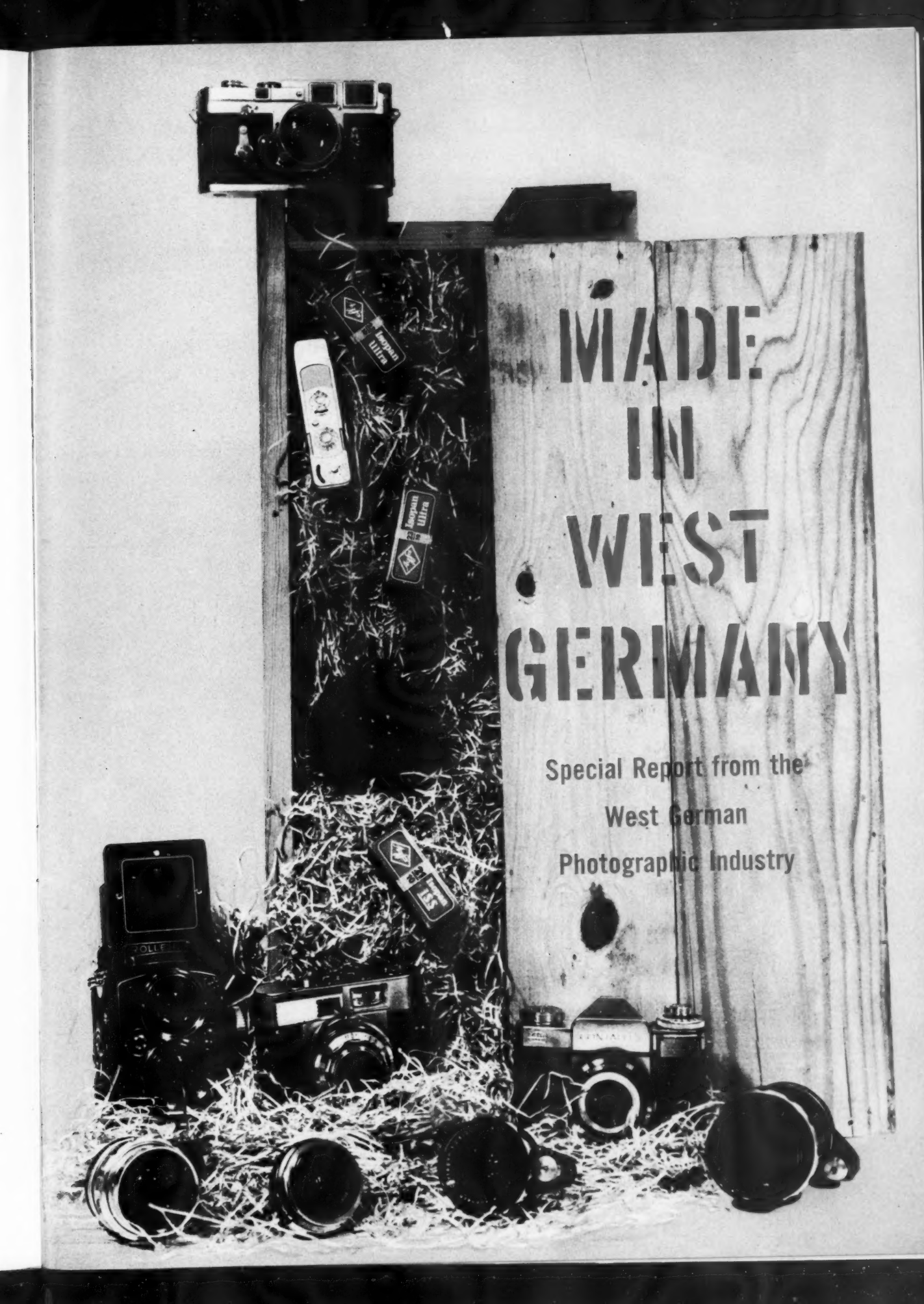
quisition of some darkroom equipment and a little more space, along with permission to process negatives in the building. The room assigned to him as a darkroom had no running water, so Shultz washed his negatives in the men's room. Although it became commonplace to see Bob Shultz hurrying from the men's room across the factory to his darkroom lugging trays and tanks, he felt that even getting a place to do part of his own processing was a step in the right direction.

"My little darkroom measured 5 x 10 ft. overall, and was partitioned off into two still smaller darkrooms. There was no air, let alone air conditioning, but the thing worked. I developed films in 4 x 5 tanks, and used stainless steel daylight tanks for the 35mm processing. About that time we also acquired a Beseler 45M enlarger and I started to do enlarging. The trays were in one room (5 x 5 ft.) and the enlarger in the other 5 x 5-ft. space. Naturally, when I processed films, the trays had to be stacked away since I did not have enough space. Although I have seen better equipped darkrooms, mine was quite adequate for the next ten months, during which time our negative file grew to 1,470 negatives, and our indexing system inaugurated."

To expedite the handling of negatives and prints, a rough contact proof is made of every negative shot and then final selection is made. All duplicate negatives bear identical numbers with the chosen negative marked "PRINTER." All negatives are filed in strict numerical order with a master index giving all pertinent information relating to the shot. Three is also a cross-reference system that heads up each project number, device number, date, and master classified index. Thus, any negative can be pulled from the file when any single fact is known about it. This is quite a time and labor saver, as people often ask for reprints of shots taken months ago with only the sketchiest bit of description.

For some time the plant had felt a need for larger quarters and in February, 1958, floor space was doubled and photography was given its share of the added area.

"It seems that we now have proper facilities and they will be quiet sufficient for a long time to come. At present we have over 2,100 negatives in the file; this works out to about five shots per day since I joined the company. The average output before installation of complete facilities was three shots per and it isn't hard to see how the equipment will pay for itself. Not only have we saved money, but I can devote more time to shooting instead of losing half my *(continued on page 95)*


MADE
IN
WEST
GERMANY
Special Report from the
West German
Photographic Industry

Schiansky

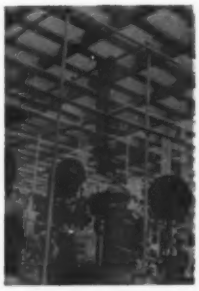
PHOTOKINA: WORLD'S MOST FAMOUS PHOTOGRAPHIC EXPOSITION

Indeed these are the magic nine days for everyone enjoying photography or making money at it: September 27 through October 5, 1958, in Cologne, Germany. Here, Photokina, the International Photo- and Cine-Exposition will once again take place.

Held every second year, Photokina is the greatest existing international photo trade fair. It is the focal point for the display of the achievements of the photographic industries and cinema technology of all producer countries and represents an economic force of powerful influence. Secondly, it is the greatest international photographic cultural show.

The imposing picture of Photokina in 1956 was described by MODERN PHOTOGRAPHY magazine this way: "Imagine being lost in a camera store 100 times larger than the biggest in the world, completely surrounded by the cameras of the future and new models of old favorites. Such a dream would represent a small fraction of the new equipment seen at this year's International Photokina at Cologne, Germany, an equipment and photographic show so large it approaches the impossible. . . On the balconies a series of tastefully displayed photographic exhibitions contained a total of 3,300 pictures by professionals and amateurs from 35 different countries."

Although one might well imagine that this 1956 description could not be surpassed, the scope of this year's Photokina is even larger! Let us compare a few figures. In 1956 Photokina had 502 exhibitors altogether: 319 German exhibitors of photographic equipment and 44 German exhibitors of cinematographic equipment, also present were representatives of 20 American firms, 119 firms from other countries. The 1958 Photokina most probably will show an increase of at least ten per cent in number of exhibitors. Instead of 660,000 square feet of space, more than 700,000 will be occupied. No nation of photographic importance will be missing. Among them will be: Belgium, Denmark, Great Britain, France, the Netherlands, Italy, Japan, Austria, Spain, Sweden, Switzerland, Czechoslovakia, the United States of America. A more comprehensive representation of photo and cine products is unimaginable. *(Continued on page W-30)*



1756 - 1958

Quality,

1840

...World's First All Metal Camera

This first metal camera was an important Voigtlander milestone in photographic history. Because of this camera and other Voigtlander pioneering advances in this field, photography did not stagnate at its very start. On the contrary, the manufacture of this camera so captured the interest of the public, that it led to the present importance and delight of photography today.

These Voigtlander "Firsts" Helped Make Photography What It Is Today!

1815 . . . World's First Theatre Binoculars—
This type of instrument which was also used as a field- and long range-glass, is still in use as a theatre and opera glass.

1900 . . . World's First Speedy Anastigmatic Lens—
The Heliar f/4.5. Even today, the Heliar still remains the favorite portrait lens with many professional photographers the world over.

1901 . . . World's First Reflex Vida Camera—
The first lighter, simpler, and less expensive camera that helped to popularize amateur photography. Also the Voigtlander stereo camera.

1929 . . . World's First Camera to Sell More Than 1½ Million Pieces—
This was the Bessa, a real "people camera" which was the nucleus of the Voigtlander program for many years.

1949 . . . First Color Skopar Lens—
This lens made colors more faithful and reduced vignetting at full aperture. The Color-Skopar was followed by the Color-Heliar, Ultron, Nokton, Apo-Lanthar, Dynaron and Skoparon—all high-efficiency lenses, all major optical advances.

Look to Voigtlander

for the photographic "firsts" of the future!

a habit for 202 years

THE PRODUCTION of quality instruments is second nature with Voigtlander. It began back in 1756 when Johann Christoph Voigtlander started creating scientific instruments such as compasses, delicate quadrants and fine testing instruments, all of such skilled craftsmanship, he won the favor of the Austrian Emperor's court. The Voigtlander philosophy is simple. Never be satisfied with anything but the best. Keep making things better and better!

With this basic principle as a guide, the Voigtlander firm can look back on many milestones, on many famous "firsts" in the camera world. Such as the wonderful new Vitomatic cameras illustrated above that have quickly established a new standard of quality and picture taking simplicity. But good as the past has been, who has time to look back? Not Voigtlander. We're too busy looking to the future and the development of many new ideas in photographic equipment.

The new camera with the AUTOMATIC eye for **COLOR**

VOIGTLANDER

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W-5

QUALITY CONTROL: KEY TO FINE PHOTOGRAPHIC EQUIPMENT

Mysterious? No! The West German photo industry guards no secret to success other than the traditional *precision* with which its products have been manufactured for many years. Thus anyone buying a West German camera knows that he has obtained equipment that has been made and tested by craftsmen.

Cameras, lenses, shutters—all receive a battery of checks and examinations during manufacture in order to supply finished products and avoid production delays. But, to accomplish this end, special testing methods which are less familiar in other countries have had to be devised. First, although a combination of camera body, lens and shutter makes up the finished camera, these parts are all separately subjected to suitability tests by their suppliers. Many individual checks are carried out before final assembly. Each body, lens or shutter firm bears full responsibility for the products it makes.

The number of different parts needed for a precision West German camera varies, of course, with the type of camera, yet still is very high. To insure uniform quality of all these parts, special machines and automatic apparatus have been designed by the German camera industry which work to extremely fine limits. But in spite of this, it is necessary to keep a constant check on these parts during production—which is why a principle of "statistical quality control" (a system of continuous machine supervision) was adopted. (Thorough as these methods were, human error was always a possible threat. In cases involving surface cleanness as well as accurate measurements, additional testing methods had to be found to eliminate the faults of human shortcomings.)

The next checks take place when basic parts are first assembled into components. These checks are especially important because all firms try to keep any unserviceable parts out of their assembly lines. Here, pneumatic, mechanical, optical and electrical methods are used. When the various components are complete and have passed through the final assembly stage, each camera is given a strict individual check-up that includes operation as well as surface cleanness. (Naturally the methods used vary according to the type of camera.) Then, to make absolutely sure of the *(Continued on page W-11)*

Why ROLLEI remains

UNQUESTIONED LEADER IN

. . . why better pictures—more published pictures are taken with Rollei than with any other camera

To produce Rollei quality requires more . . . *much more* . . . than just business sense and a knowledge of fine mechanics. It must start with an *ideal.* And to make that ideal a reality, *original* thinking and *original* design concepts are essential . . . as well as complete dedication to the ideal in every step of manufacture and assembly.

This is the atmosphere in which Rollei was originally created . . . and in which Rollei is made to-day. Expert design talent is constantly contributing to the basic camera *new features* which keep Rollei far ahead in convenient, fool-proof handling . . . greater flexibility in usage . . . and more accurate picture results.

In the manufacture of each part, only the best suited, longest-lasting materials are used, and closest tolerances maintained. Then only highly skilled, experienced hands build the camera: *because hesitant hands cannot produce quality worthy of this great name.* And that high quality is maintained through-out every manufacturing step, by the most modern scientific controls.

Thus Rollei has become the inevitably relied upon *working tool* of professional photographers the world over . . . as well as the favorite camera of critical amateurs and other camera users who appreciate that only a *top quality* camera can give consistently perfect picture results . . . complete satisfaction . . . through-out the years. See Rollei at your dealers now, or write for literature.

Now . . . the greatest values ever in ROLLEI CAMERAS!

Rolleiflex f:3.5

with XENOTAR lens . $199.95
with PLANAR lens . . 214.95

with built-in meters:
XENOTAR lens 234.95
PLANAR lens 249.95

Rolleiflex f:2.8

with XENOTAR lens . $259.95
with PLANAR lens . . 274.95

with built-in meters:
XENOTAR lens 294.95
PLANAR lens 309.95

Rolleicord Va

The five format camera — takes pictures 2¼ x 2¼, 1⅝ x 2¼, 1⅝ x 1⅝ for super slides, Bantam size and 35 mm. LVS shutter, XENAR lens. $99.50

Rolleiflex 4x4

Uses #127 roll film — negative size 1⅝ x 1⅝ (super-slide size) Automatic operation — Synchro-Compur LVS shutter — Schneider XENAR 3.5/60 mm lens. $133.65

All prices without cases. Interchangeable counter dials for Rolleicord Va extra.

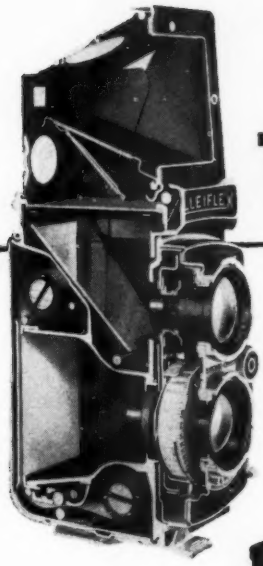
FRANKE & HEIDECKE,
BRAUNSCHWEIG,
WEST GERMANY

Distributors:

Burleigh Brooks, Inc. 10 W. 46th St., New York 36, N. Y.

PONDER & BEST, INC. 814 N. Cole Ave., Hollywood 38, Calif.

TWIN-LENS CAMERAS



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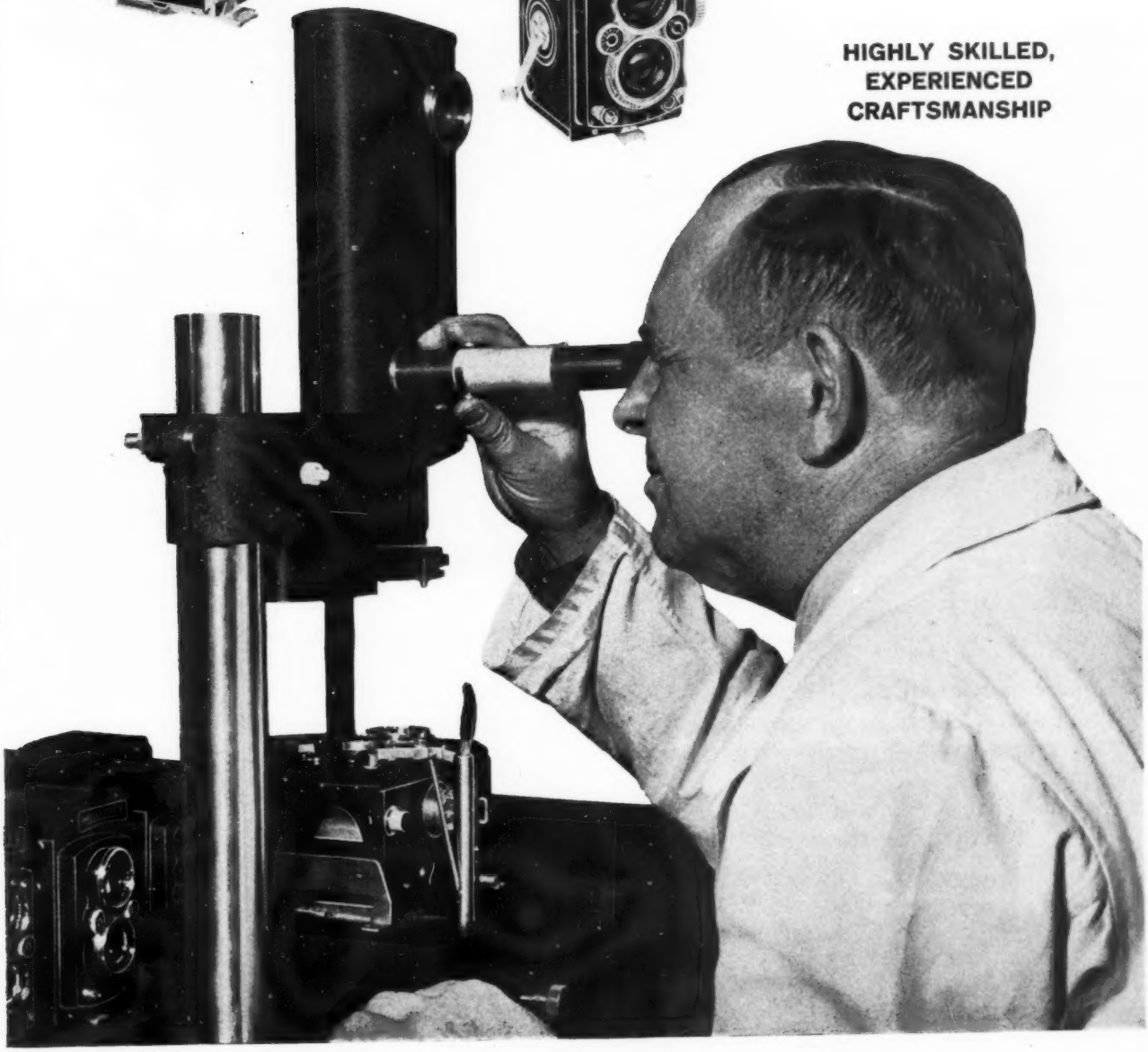
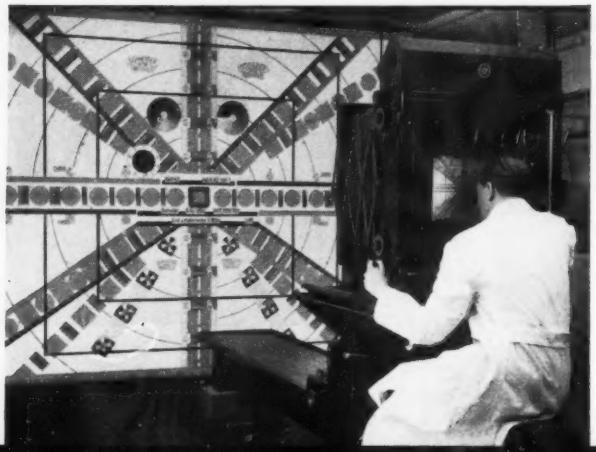


Electronic device tests how moving parts are working.

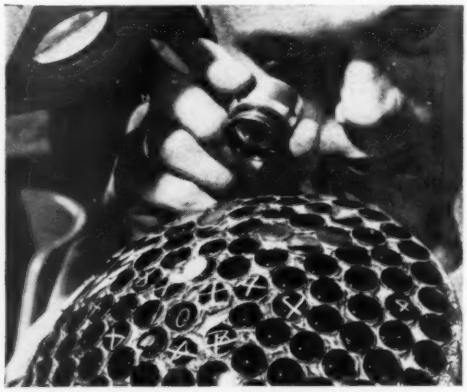
Full view of large assembly room. Neatness is essential!

Targets and telescopes are used to check viewfinders.

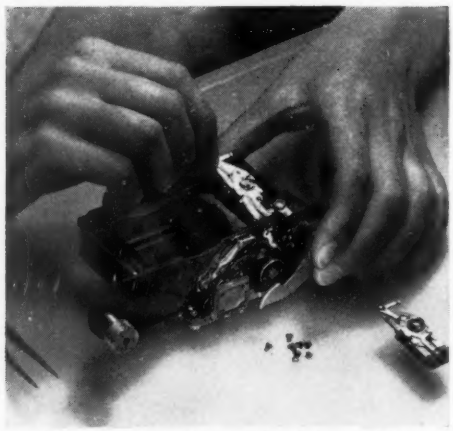
A 300mm lens receives meticulous target check-ups.



For 2¼ reflex: a lens alignment test.

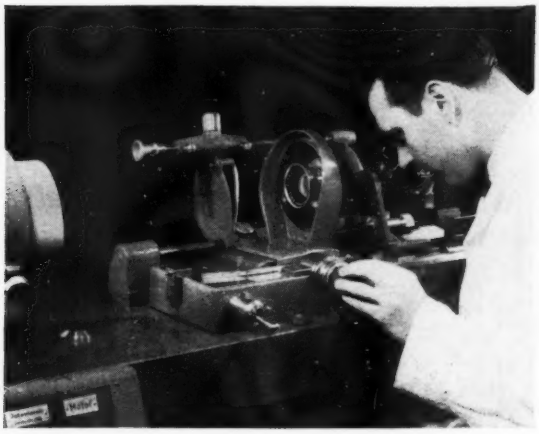


Lenses are mass polished, then inspected.



A delayed action release is built into a 35mm.

Optical characteristics of lens are checked by collimator.



QUALITY *(Continued from page W-6)*

camera's operational reliability all its parts are tested once more—a long and tedious final check.

Although every camera is given an extensive final check-over of this kind, some firms go even further and make special test exposures on film. Filed away with the manufacturing records in the makers' plant, these test negatives are proof at any time that the camera operated properly and met the required standard.

Apart from all these examinations, additional spot checks are made on each production series. This guarantees that results remain constant in a given production batch. Some tests are made in laboratories where cameras are examined for light leak and for reaction to heat, cold and tropical conditions. The hard, practical test to prove their shock resistance and sturdy construction can also be regarded as a check. With some camera selected at random, endurance tests are carried out in which the mechanism is operated many thousands of times to discover any weak parts.

Checks by the optical industry

Even before actual manufacture starts, checks are made on raw glass. The intermediate examinations which follow are so arranged that unsuitable elements or those requiring further processing are removed from the production line.

Naturally, there are different methods of lens checking, depending on the type of objective desired. A lens for the professional and advanced amateur photographer, for example, is given a vigorous test, since the demand made on it is particularly high. In this connection, the West German optical industry in recent years has increased the practice of testing for close-up photography. For this purpose, a test wall is used, with a special camera placed in front of it, fitted with the lens being tested, and loaded with film or plates. These are studied under a microscope, and, by analyzing the results, the operator can check its resolving power.

When testing photographic lenses having focal lengths of about 28mm to 150mm, some manufacturers used collimators with which the quality of the lens can also be studied and judged by means of a microscope. One special method of this kind is known as autocollimation. Here a large number of lenses can be checked in a short time, which reduces checking costs and still gives maximum testing accuracy.

Tests go beyond those for lens resolution in order to get a sharp image. For example, the flange (to focal plane) distances of interchangeable lenses must be kept to very close tolerances. With a single-lens reflex (or a camera in which the shutter leaves of the between-lens shutter are behind the optical system) the back focus of the lens should not fall below a certain minimum.

Other tests for certain types of lenses are determined by an interferometer with which it is possible to detect slight streaks in the glass, eccentricities and very small deviations in radius.

Some of the West German optical firms adopt what is known as the projection test for checking 35mm camera lenses. The lens to be tested is placed in a special projector containing a test slide.

Checks by the shutter industry

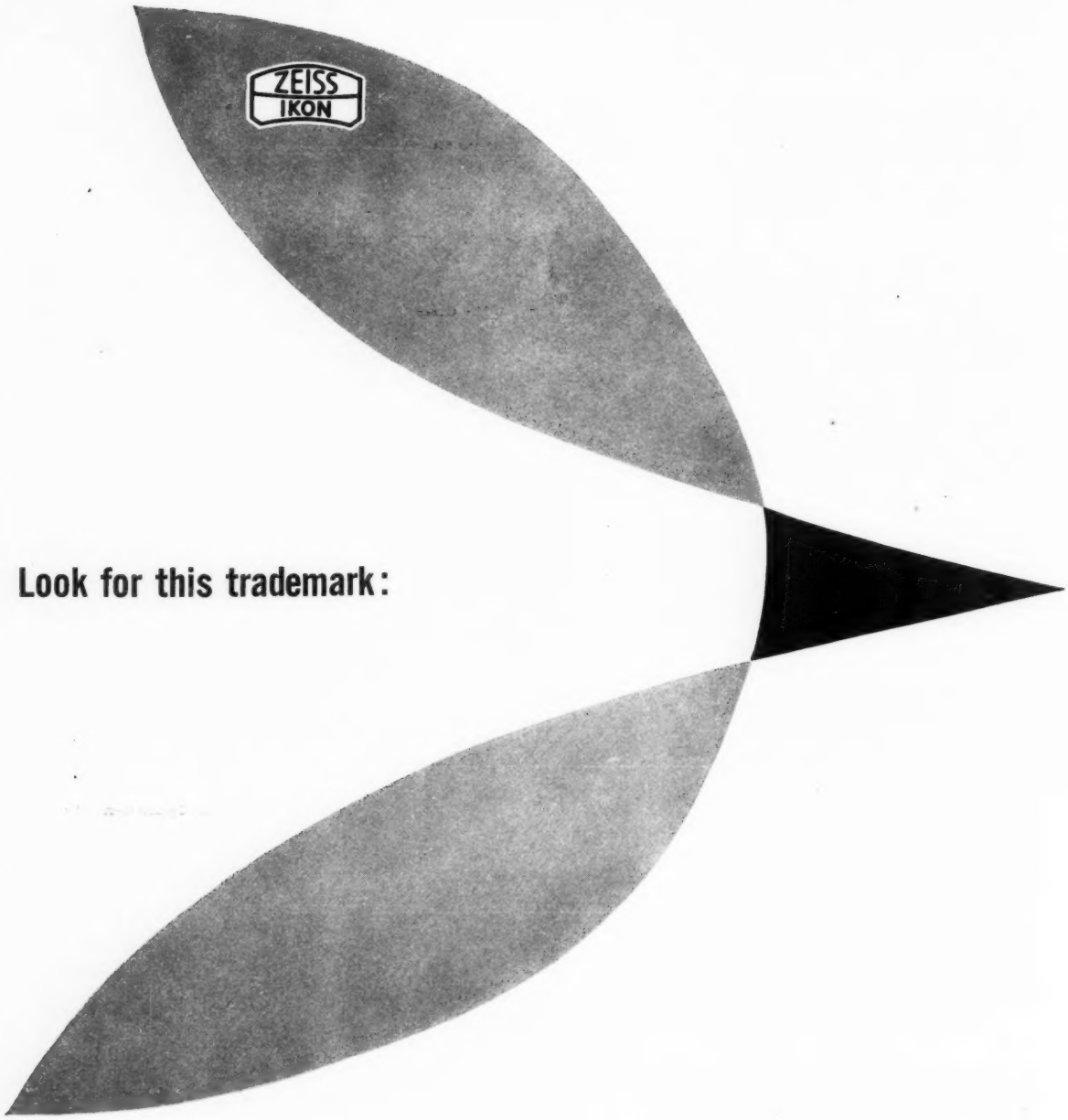
German shutter manufacturers give their products severe tests—it is no exaggeration that those passing this examination are described as "high-performance precision shutters." Here again, the checks start with the separate parts and initial components. But most important of all is the final operational check-over. A special apparatus constantly controls operation and rejects defective shutters. The reason for the fault can be determined later without the need for continuous supervision of it and thus production slowdown.

These operational tests, which control all the functions of the shutter, are combined with a supplementary electrical device for testing the flash contacts.

Special equipment is also required to check shutter speeds. Electronic machines are used for the actual measurements as photographic methods would be too tedious. Very often special time measurements are made, particularly for single-lens reflex cameras having pre-set diaphragms, and these enable the diaphragm closing time to be controlled exactly.

Finally, electronic measurements must be made to see that camera shake, caused by releasing the shutter, does not impair its operating efficiency in any way. Further shutter tests in conditioning cabinets and special cold chambers determine resistance to climatic conditions. Not only is this the best way of ensuring satisfactory operation of the shutter mechanism, it also signals any signs of fatigue or risk of breakage.

Whether for cameras, lenses or shutters all the production tests and checks mentioned here show with what seriousness the West German photographic industry regards its work. The industry is conscious of its great responsibility in continuing to supply the world with precision cameras.—THE END



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affixed to every Zeiss Ikon camera

ZEISS IKON

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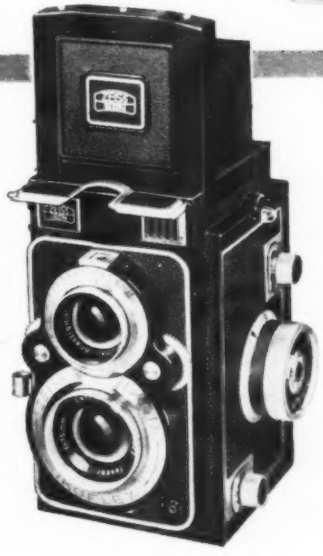


Ikoflex

FAMOUS FIRSTS FROM THE WEST GERMAN PHOTOGRAPHIC INDUSTRY:

1826, first astronomical f/3.5 four-element lens, C. A. Steinheil

1839, first pocket size camera, C. A. Steinheil

1840, first all metal camera, Voigtlander

1840, first computed photographic lens, Petzval of Voigtlander

1890, first anastigmatic lens, Protar, Carl Zeiss

1895, first objective with interchangeable front element as convertible lens Double Protar, Zeiss

1924, first widely successful 35mm camera, Leica A, E. Leitz

1928, first leaf type shutter with ring setting, speeds up to 1/300 sec., self timer, Compur-Werk

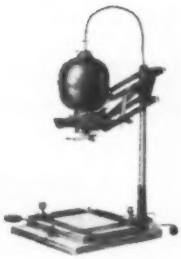
1929, first 2¼ twin-lens reflex, Rolleiflex, Franke & Heidecke

1930, first 35mm camera with interchangeable lenses, Leica C, E. Leitz

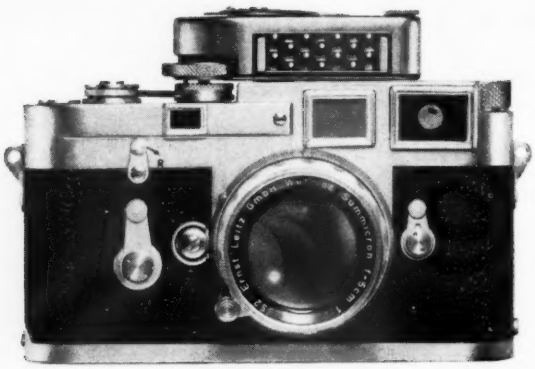
1931, first 4 x 4cm twin-lens reflex, Rolleiflex, Franke & Heidecke

1931, first 35mm camera with interchangeable lenses coupled to rangefinder and 1932, first camera with a rotating wedge rangefinder, Contax I, Zeiss Ikon

1933, first automatic enlarger for 35mm negatives, Focomat I, E. Leitz

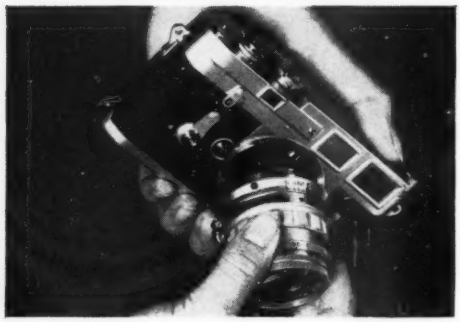


(Continued on page W-18)



THE LEICA M-3 MAKES PHOTOGRAPHY SO FASCINATINGLY SIMPLE

• In seconds...the best composition • Pick the frame that suits you with the M-3's unique "frame selector" • Press bayonet lock button and twist lens slightly—it's out • Snap in lens matching frame you selected • Focus and shoot • That's all there is to it. When you put the bayonet-mount Leica lens (35, 50, 90 and 135 mm) on the camera, the correct frame stays in view, the range-finder is coupled, and **parallax is automatically compensated** throughout the focusing range.



• In seconds...the best exposure • Pick f-stop on your lens • With knurled control, line up the Leicameter MC dial so that your f-stop is opposite indicator needle • Your shutter speed is now set • Focus and shoot • That's all there is to it. The Leicameter MC goes onto the M-3 simply, coupled to the shutter speed dial. If you want a certain shutter speed, simply set it into the camera with the knurled knob and then look opposite the indicator needle. There's your f-stop.

The LEICA M-3 frees you from complications so that you can concentrate on your subject. What could be more fascinatingly simple and give you the precision of the Leica M-3? It makes picture-taking a real pleasure. Ask your LEICA Franchised Dealer for a demonstration.

27258

Leica

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U.S. Distributors: E. Leitz, Inc., 468 Fourth Avenue, New York 16, N. Y.

it takes patient hands to build a precision camera

These patient, skilled hands belong to a craftsman in Wetzlar, West Germany. When 848 parts and 5,548 production stages go into a precision 35mm camera with a top-notch lens, hands are important. Automatic machines may turn out even the smallest parts with microscopic exactness, but machines can't do everything—and when it comes to assembly, skilled hands with years of training must take over. These are the hands of a man proud of his responsibility, working on a Leica M-3, incomparable in its precision. The entire M-3 is assembled by hand, as well as such sub-assemblies as the shutter, the rangefinder-viewfinder system, the lenses. The production stages include hundreds of inspections in which critical eyes and expert hands use the finest measuring devices in the world to check tiny tolerances. It all adds up to precision and ruggedness which will last a lifetime.

When you buy a camera, make sure it's built with this care and precision.

When it bears the name LEICA, it is precision at its ultimate. Leica cameras, lenses and photographic accessories are made by Ernst Leitz GmbH in Wetzlar, West Germany.

Leica

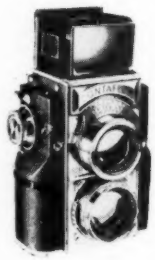
Branch works: Leitz (Canada) Ltd., Midland, Ontario.

U. S. Distributors: E. Leitz, Inc., 468 Fourth Avenue, New York 16, N. Y.

1934, first camera with viewer and rangefinder in one eyepiece, Contax II, Zeiss Ikon

1935, first factory coated lens, Zeiss

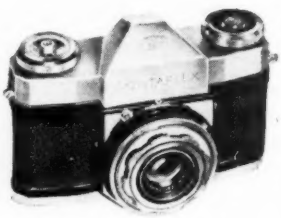
1935, first camera with built-in photoelectric exposure meter, Contaflex twin-lens reflex, Zeiss Ikon



1936, first triple-layer color film incorporating dyes which did not wander, Agfacolor, Agfa

1953, first fully automatic diaphragm in interchangeable lens, Schneider

1953, first single-lens reflex camera with between-lens shutter and fully automatic iris diaphragm, Contaflex I, Zeiss Ikon



1954, first 35mm camera with mirror-reflecting view finder-

(Continued on page W-20)

QUALITY CAMERAS AND FINEST LENSES

go hand-in-hand

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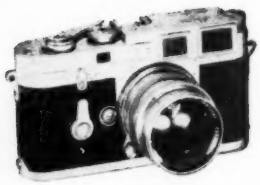
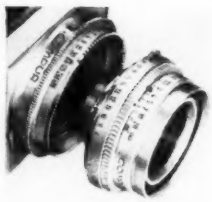
rangefinder and automatic image outline masks, Leica M3, E. Leitz



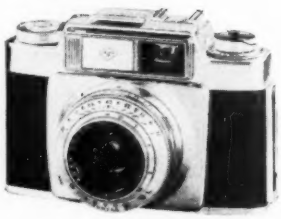
1954, first leaf type shutter with LVS, coupled lens diaphragm and shutter speed scales, Compur-Werk

1956, first 2¼ sq. with automatic exposure, Agfa-Automatic 66, Agfa

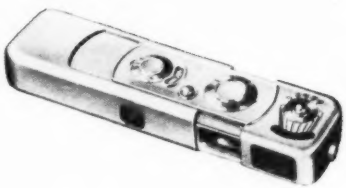


1956, first leaf type shutter enabling interchangeability of lenses and incorporating automatic depth of field indicator, Compur-Werk

1957, first 35mm with between-lens shutter coupled to built-in exposure meter, Vitomatic I, Voigtlander, and Silette SL, Agfa, with Prontor-SLK, Alfred Gauthier



1958, first ultraminiature camera with built-in photoelectric exposure meter, Minox



Steinheil presents...the new f1.9 Auto-Flash Quinon 55mm lens with built-in flash calculator for the Exakta!

The new F1.9 Steinheil Auto-Flash Quinon 55mm lens with automatic diaphragm, is one of the most interesting and remarkable objectives ever produced! This newest automatic lens for the Exakta features a smart, new calculating device which accurately computes and indicates diaphragm stops and distance settings for flash pictures! For color the Auto-Flash Quinon is superb. Excellent correction, maximum definition, fine contrast and high speed make the Auto-Flash Quinon a truly extraordinary objective... Price $169.50 list.

Steinheil Optical Works in Munich, Germany, has devoted more than 140 years of continuous progress and service to the field of photography.

Today, Steinheil ranks first as the leading manufacturer of precision automatic lenses for Exakta cameras. Steinheil lenses with automatic diaphragm are now available in various focal lengths for normal, wide angle and telephoto photography.

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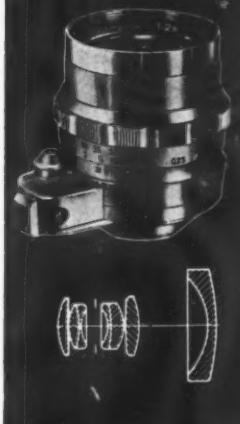
STEINHEIL F2.8 QUINAR 135MM AUTOMATIC TELEPHOTO LENS FOR EXAKTA

The five element Quinar Telephoto lens has achieved world wide prominence as the most outstanding fully automatic telephoto for the Exakta. Its fine optical qualities and dependable automatic mechanism have made this lens a spectacular success. Price $189.50 list, including leather case and sunshade.

STEINHEIL F2.8 AUTO-QUINARON 35MM AUTOMATIC WIDE ANGLE LENS FOR EXAKTA

This seven element wide angle lens with automatic diaphragm was especially computed for the Exakta camera. Ideal for both color and black and white photography, the Auto-Quinaron combines the latest advancements in optical design ... Price $149.50 list.



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In the last decades of the past century, Carl Zeiss started a new era in photographic lenses and optical instruments. Hardly any other name has won such world-wide renown in this field.

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Zeiss achievements in optics cover the entire field of scientific instruments:

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Geodetic instruments • Highest precision fine measuring devices
Interferometric instruments • Spectroscopic instruments • Planetaria
Astronomical instruments • Electron microscopes, etc.

Make sure your camera has a Zeiss lens

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Oberkochen (Wurt)
West Germany

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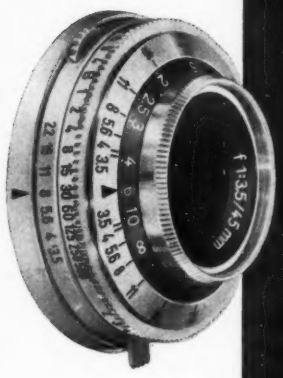

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More than 50 years of experience in the construction of between-the-lens shutters, epoch-making developments in the field of photographic science and modern methods of manufacturing have made the COMPUR-name a hallmark of precision and reliability

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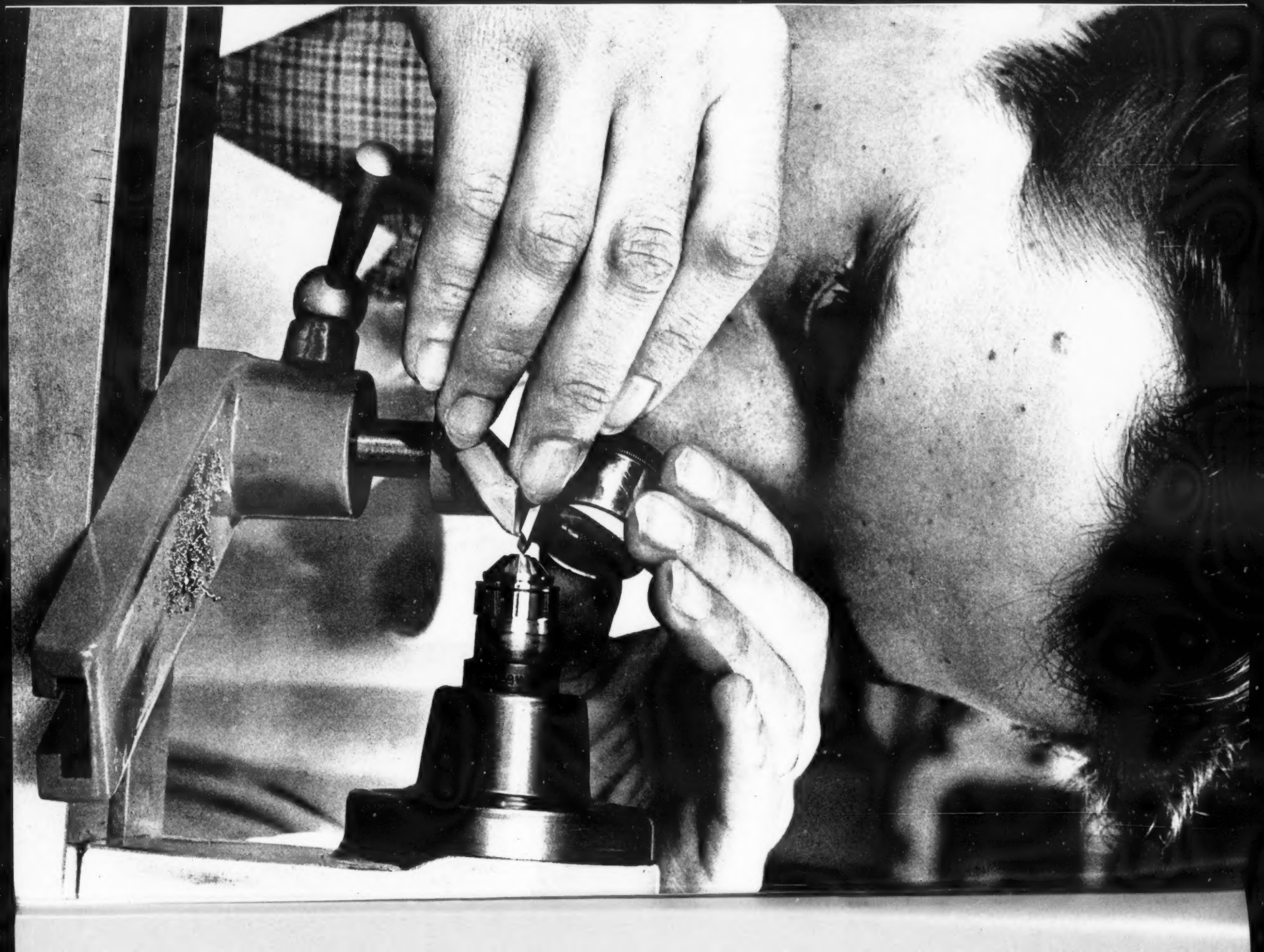

WEST GERMAN APPRENTICE SYSTEM: KEY TO PRECISION PRODUCTS

The West German photographic industry faces the future with confidence, knowing that it has a reserve of young technicians and specialists who have had the most exacting professional training in the field of precision mechanics and optics. The West German training instructors take particular pains with the new apprentices who come to them year after year. They realize the great responsibility which has been entrusted to them by the photo industry and the obligation they have towards these young people who must be trained as reliable and efficient tradesmen in a period of 3½ years.

Only the best applicants are selected by the professional advisory centers located in various towns and cities. Then the individual photo firms give these young people aptitude tests based on very high standards. These high standards can be set according to their particular needs by the individual firms since there are always more young people applying for training in the West German photographic industry than can be accepted.

To meet the requirements of the aptitude test each applicant must pass both practical and theoretical examinations, regardless of whether he wants to be an optician, precision mechanic or toolmaker. He is examined for his overall intelligence as well as his particular talents, manual skill and carefulness in practical tests. The marks obtained in this first examination are kept and used for comparison purposes in all intermediate examinations and for the final grading after the training course is completed. This first aptitude test is, of course, based on the latest knowledge available regarding personnel management and on the most modern vocational testing methods. Some of the tasks set for these apprentices are very exacting, if you keep in mind that their age range is generally between 15 and 17 years.

Most firms follow this first examination with a basic course on precision mechanics lasting about six months. Only then do the students enter the apprentice workshops. After learning their materials and future tasks, the apprentices must try their skill on various machine tools. Finally, after two years, the apprentice must be able to make complicated *(Continued on page W-28)*

More and more camera owners say:

„You're Shutter Sure,

With PRONTOR!"

Every PRONTOR shutter is a fool-proof, precision and quality product. 55 years of experience in shutter manufacture guarantees that PRONTOR shutters always incorporate the latest technical improvements as well as simplicity in handling.

PRONTOR shutters confirm the world-famous reputation of German Craftsmanship.

PRONTOR shutters carry the trade-names:

PRONTOR-SLK · PRONTOR-SVS · PRONTO · VARIO · VERO · VELIO

and our AGC trade mark. Bear this in mind, when next you buy a camera.

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W-26

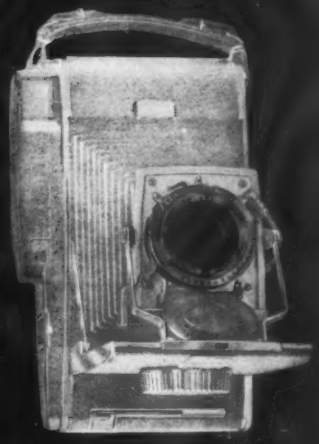
WORLD-FAMOUS CAMERA MANUFACTURERS CHOOSE Rodenstock LENSES!

LINHOF SUPER TECHNIKA

the finest and most versatile large-format camera, and press cameras are equipped with brilliant Rodenstock Heligon standard and Rotelar telephoto lenses. Also for this field, new Rodenstock Apo-Ronars and the unique Rodenstock Imagons.

ARRIFLEX 16

the finest and most versatile 16-mm professional motion picture camera, is supplied with the superb Rodenstock Heligon "Rainbow" lenses.



POLAROID LAND 110A

the finest, top-quality model of the entire Polaroid Land "picture-in-a-minute" camera line, comes equipped exclusively with the outstanding Rodenstock Ysarex lens.

Every day, important camera manufacturers pay homage to Rodenstock lenses! They mount Rodenstock lenses on their finest, deluxe camera models, recognition that Rodenstock optical quality and design are magnificent.

The makers of such superb cameras as Linhof, Arriflex, Polaroid Land, Kodak (West Germany) Bauer and Nizo depend upon the 80 years of optical knowledge and acumen, manufacturing experience and precision, back of the Rodenstock name. They depend upon the Rodenstock family tradition of quality and design leadership, today guarded by a third generation Rodenstock and 3,500 scientists and skilled technicians who work with tolerances as infinitesimal as 1/100,000 of an inch. You, too, can depend upon Rodenstock for finest results with your still and movie cameras, enlarger, projector and process equipment.

Munich Works

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APPRENTICES *(Continued from page W-25)*

Precision still depends upon workman's early training.

For 3½ years, apprentices work under skilled instructors.

parts with absolute precision from a drawing, working on his own. He must also be able to carry out simple assembly jobs.

These early activities are, of course, completely unprofitable for the plant. But every firm knows the importance of training an apprentice in reliability and precision right from the start. Despite the present-day use of automatic machines and lathes, which relieve the operator of much responsibility, the West German photographic industry has not departed from this rule. This policy is the secret of its uninterrupted success, since the value of West German photographic equipment is not dependent upon design progress alone, but also on precision and production consistency.

The uniform training plan, established in West Germany for each profession, also applies to the trades of optician, precision mechanic and toolmaker in the photographic industry. Apart from ensuring near uniform training systems at all firms, this arrangement makes it possible to train a staff which can be moved from one firm to another at a later date.

Once the apprentices are familiar with the machines and their tools, they are allowed to make separate parts for current production. Their working week is 40 hours in length, including the hours spent on training and special instruction. They are also entrusted with small series production of certain items. This helps them to acquire basic skills for filing, drilling, thread-cutting, shaping, milling, turning, grinding and measuring.

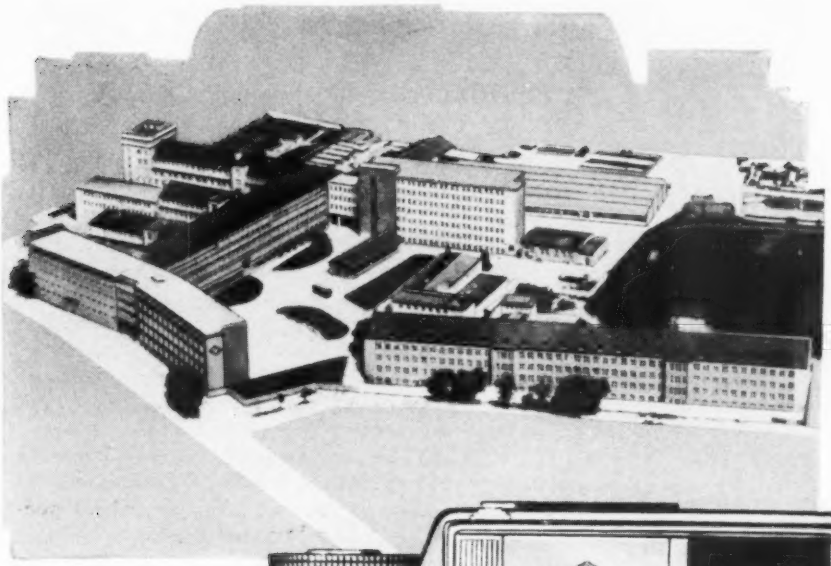
Apart from his normal activities, the apprentice spends at least four weeks in the surface finishing and hardening departments. Here he is always given the feeling that he is making parts or products needed for production purposes and of commercial value to the firm. This serves a double function: providing an incentive for ambition and developing a feeling of responsibility. At this stage the duties for which the apprentice is specially suited are already apparent, as are his capabilities for specialization.

Optical trade apprentices undergo a similar training. They must learn the basic procedures of glass cutting, shaping, grinding, smoothing, polishing and centering the workpiece to exact thicknesses. They must also know the production of lenses and prisms. Their final examination usually includes the production of a complicated combination of glass prisms with ground spherical surfaces and some cemented lenses.

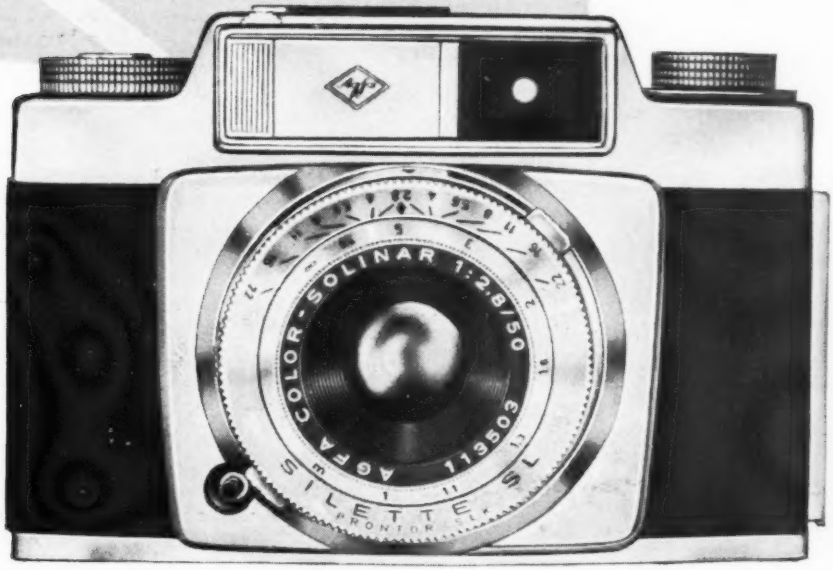
The assignment to new duties always depends on intermediate examinations. Here not only the opinion of the instructor counts, but the apprentices themselves are expected to criticize and judge their own work.

The marks obtained from these tests are always entered on a report sheet kept by the instructors for each apprentice during the period of his apprenticeship. The apprentice also keeps a book in which he records all he has seen and learned. In this way he is forced to think and reflect about the work he has carried out. This report book is checked regularly and

(Continued on page W-32)



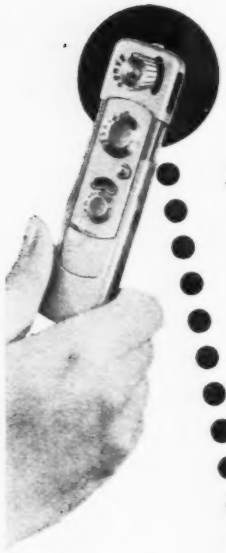
Agfa Camera factory
Munich
Tegernseer Landstrasse



Agfa Silette SL with automatic exposure coupling!

Agfa

At the Agfa Camera factory, Munich every conceivable modern aid in process technique and organisation is available to the 4000 employees of the firm. Experience in camera design over many decades, systematic research and development, extreme precision in camera and lens manufacture as well as careful controls of the finished product have won the Agfa Camera factory the confidence of photo enthusiasts the world over. There are Agfa roll films and miniature cameras to suit all tastes, at prices ranging from DM 14.– to DM 315.–, including the Agfa Silette SL – an entirely new achievement in camera design: the first camera with automatic exposure coupling!



Perfect results... Picture after Picture!

The new

MINOX B

ultra-miniature camera has a built-in coupled exposure meter to give you perfect results-picture after picture!

Just twist a dial to match a pointer and—presto, you are ready to shoot; the shutter is set **automatically** for the correct speed.

With the MINOX B, picture-taking becomes an even greater thrill —with good pictures every time.

MINOX

Built-in coupled exposure meter with two measuring ranges—Sliding blade shutter ½ to 1/1000 second, B, T, with flash synchronization—15 mm f:3.5 Complan 4-element lens always works at maximum opening—Extreme depth of field—Focuses from infinity to 8" closeups—Telescopic Rapid Shutter Cocking and Film Transport—Exposure Counter—Two built-in filters —Built-in lens shade

Ask your camera dealer for a demonstration of the amazing new MINOX B and the MINOX (without built-in meter) or write for interesting free literature to:

MINOX GmbH., Giessen, Box 137

Sole U. S. distributor:
KLING Photo Corp.
New York 10
Los Angeles 46

PHOTOKINA *(Continued from page W-3)*

Of course, the hottest question is: What will be *new* at Photokina? It would seem to be easier to get top secrets out of the Pentagon than out of the photo industry. Certain trends, nevertheless, are apparent, as far as the West German photo industry is concerned. They are in the direction of more and more automatic exposure devices actuated by, or related to, built-in photo electric cells; also, more and more lens interchangeability and a constantly improving lens quality where evenness of field coverage is being stressed and extremely fast lens speeds subordinated.

On its cultural side, Photokina will again offer a variety of picture exhibits, both still and movie, demonstrating the many applications of photography. Seventeen of these shows have been announced for 1958.

In contrast to the American scene, where trade fairs are appendices to the yearly dealers' conventions, Photokina has always been a trade fair and picture exhibition in its own right, organized by the West German photographic industry jointly with the Cologne Fair and Exhibition Corporation. The photo industry determines overall policy, whereas the Exhibition Corporation runs administrative and financial details.

L. Fritz Gruber, Photokina's Executive Director since 1949, is the person who is responsible for bringing the heterogeneous elements of Photokina into a workable whole. While Photokina is primarily a trade fair, the directors also want to attract the general public.

It is now ten years since the idea of Photokina was begun. After the currency reform in West Germany in 1948, the photographic industry was unwilling to exhibit at the Leipzig General Fair, held behind the Iron Curtain. They chose Cologne as a site, both because of its central location and because of the giant exhibition halls ideally situated on the Rhine River bank across from the famous Cathedral.

The first Photokina, in 1950, confined to the products of the West German photo industry alone, turned out to be a tremendous success. The non-German photo producing countries immediately asked to participate in future shows. So from 1951 onward Photokina became a photographic world's fair on German soil.

The West German industry has invited and is still inviting on an equal basis all international competitors who believe in, and act according to, decency and fairness in business. Moreover, West German manufacturers know that they can only profit from competition.

Photokina was thus created and is being operated in the spirit of international understanding, promoting photography as a hobby, as a service to science and industry, and as a business. The World Exposition of Photography and Cinematography will be opened by the President of the Executive Council of UNESCO, Vittorino Veronese, and by the President of the German Federal Republic, Professor Theodor Heuss on Sept. 27, 1958. Photokina will be the nine-day wonder of photography and cinematography!—THE END

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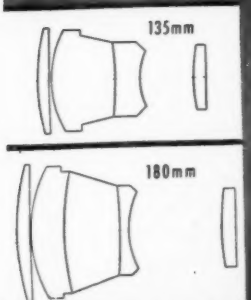
a new series of sensational lenses which are recognized as the most advanced lenses ever created especially for the Exakta!

• With these two incredibly precise new lenses, and more to follow, Isco brings to Exakta camera owners a new series of "miracle" lenses that optical science has not been able to produce until now! Small and compact, the Tele Iscarons are *TRUE TELEPHOTO LENSES!* And although small in size when compared with other lenses, they are large aperture, fast speed objectives that assure the critical Exakta user far better results than was ever thought possible!

• Free from aberration, Tele Iscaron lenses will give excellent performance from the largest aperture to the smallest opening! Sharp rendition, remarkable corner to corner brightness, and maximum resolution with perfect contrast are typical of Tele Iscaron's high optical lens standards! The F2.8, 135mm. Isco Tele Iscaron lens has a fully automatic diaphragm mechanism which ranks as one of the best available today.

• You'll get highest quality pictures with Tele Iscaron lenses! Be sure to ask your Exakta camera dealer to show you these exciting new lenses from Germany's world-famed optical laboratories!

NEW, EXCITING LENS FORMULAE!



ISCO OPTISCHE WERKE GMBH GÖTTINGEN

West German apprentices are chosen from a very young group. Usually age range is between 15 and 17 years.

is also considered in the final examination grading.

In addition to the practical work performed in up-to-date apprentice workshops, the technical and theoretical side of photography always occupies an important position. Particular emphasis is placed on a photo-technical education. All apprentices must acquaint themselves with photography, optics and cameras in particular. In addition to increasing their technical knowledge, this strengthens the feeling of association with the products manufactured by the various plants.

In some firms monthly discussion groups are arranged for further education of a general nature. The object of these sessions is to introduce the young people to the community in which they work and to acquaint them with conditions in the plant. This encourages the apprentices to become responsible, cooperative and creative members of the firm.

Occasional gymnastic and swimming training under the leadership of a sports instructor provides physical recreation and helps eliminate any defects in regard to personality development and deportment. Some firms also take their apprentices on conducted tours of other plants, usually suppliers or firms belonging to the raw materials industry. Twice a year there is an organized outing for the apprentices.

During the final eighteen months of their training, future specialists pass through different departments of the firm in order to get to become familiar with the various operations and to obtain a general picture of the plant's organization. Everywhere they go specialists are on hand to advise them. These are men who have been with the firm for many years and who possess great practical experience. They also provide good examples because of their own accomplishments.

The 3½ years of training concludes with a specialists' examination set by the Examining Board of the relevant Chamber of Industry and Commerce. The regulations for this final examination stipulate that it must never be undertaken at the apprentice's own firm. If he passes, the apprentice receives a skilled worker's diploma showing his marks for practical skill and theoretical knowledge. Apart from this, the apprentice receives a testimonial from his firm containing the usual particulars regarding his period of apprenticeship, his conduct and technical ability.

This is by no means the end of his training. Every young apprentice, who receives skilled workers' rates of pay after finishing his apprenticeship, has the chance to take a further course of instruction given in and outside his firm. After a few years of practical work, capable and ambitious young men attend evening classes at technical schools. Attending these courses, (ten hours of instruction per week for three years), they acquire the knowledge needed to become a "state-tested technician."

Thus the West German apprentice system serves its photo industry as the key to the continuing production of precision equipment and materials.—THE END

FRESH

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PMI

PHOTO METHODS FOR INDUSTRY

33 West 60th St. • New York 23, N. Y.

FOR RENT

THE BEST IN MOTION PICTURE EQUIPMENT

If equipment costs have stopped your in-plant film program in its tracks there's a way to ease the financial load on your budget and still have everything you need to make a good motion picture—renting motion picture equipment.

If your motion picture work is limited to only an occasional film, renting may be the best answer from several aspects. Your rental charges over a period of years may never equal the total cost of buying the equipment. Once you plunk down money on a camera, dolly or even a splicer, furthermore, that's the equipment you will have to use until it falls apart. But if you rent you have a choice of the latest and best on the market — and the opportunity to fit the equipment to the job, with possible tax advantages as well.

Motion picture equipment rental companies are spotted in large cities throughout the United States. Some of them will ship equipment anywhere in the world. This relieves you of part of the burden of transporting equipment if you go on distant location.

The chart on these two pages samples what's available and the people who supply it. Camera rental charges may be as low as $5 a day for the simpler 16mm's on our chart to about $125 per week for the more elaborate 16's. A Colortran lighting unit may run between $4 to $9 a day, again depending on the model. Other lighting units range from a mere $1.50 per day to perhaps $175 a week. Prices generally are the same throughout the country—with minor regional fluctuation and variation.

The final decision on whether to buy or rent rests on two things: Do you shoot often enough to make it more economical to own than to rent? Will the equipment you buy cover most if not all the filming situations you're called on to meet?

—MYRON A. MATZKIN

EQUIPMENT FOR RENT / NAME & ADDRESS OF RENTER ▼	CAMERAS						
	Auricon	Bell & Howell Standard	B&H Eymo	B&H Filmo	Kodak Cine Special II	Arriflex	16mm Maurer
Benjamin Berg Co 1410 N. Van Ness, Los Angeles, Calif.							
Birns & Sawyer 8910 Santa Monica, Los Angeles, Calif.	●		●		●	●	
Camera Craft 6800 Sunset Blvd., Glendale, Calif.	●	●			●	●	
Camera Equipment Co. 315 W. 43 St., New York, N.Y.	●	●	●	●	●	○	○
Camera Mart 1845 Broadway, New York, N.Y.	●	●	○	●	●	●	●
Charles Ross, Inc. 333 W. 52 St., New York, N.Y.							
Electromation Co. 1646 18th St., Santa Monica, Calif.							
Erro Film Service 6069 Sunset Blvd., Los Angeles, Calif.							
Florman & Babb 68 W. 45 St., New York, N.Y.	●	●	●	●	○	○	○
Gordon Enterprises 5362 N. Cahuenga Blvd., N. Hollywood, Calif.	●	●	●	●	●	○	○
Hollywood Camera Exchange 1600 Cahuenga Blvd., Hollywood, Calif.	●		●	○			
Hollywood Film Co. 956 Seward St., Hollywood, Calif.							
J. G. McCallister, Inc. 1117 No. McCadden Pl., Los Angeles, Calif.							
Jack A. Frost 234 Piquette Ave., Detroit, Mich.							
Lloyds 1614 Cahuenga, Hollywood, Calif.	○		○			○	
Mark Armistead, Inc. 1041 N. Formosa, Los Angeles, Calif.		○	○	○		○	
Moviola Mfg. Co. 1451 Gordon, Los Angeles, Calif.							
National Cine Equipment, Inc. 209 W. 48 St., New York, N.Y.	○	○	○	○	○	○	○
S.O.S. Cinema Supply Corp. 602 W. 52 St., New York, N.Y.	●	●	●	●	○	○	○
Standard Camera 7901 Santa Monica, Los Angeles, Calif		●	○				
Television Equipment Co. 161 E. Grand Ave., Chicago, Ill.	○		○	○	○	○	
Western Cine Service Inc 114 East 8th Ave., Denver, Col.				○		○	

ERAS					LIGHTING						EDITING					SOUND		MISC.	
Kodak Cine Special II	Arriflex	16mm Maurer	Mitchell 16mm	Camerette	Colortran	Duce	Spots, baby	Booms	Spider Boxes	Generators	Moviolas	Rewinds	Synchronizers	Splicers	Viewers	Recorders	Mikes and Mike Booms	Dollies	Tripods
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FUHRING'S EGGHEADS

Tomorrow you may be called upon to photograph your firm's engineers or scientists. It takes patience, diplomacy and skill, says expert Robert Fuhring

"Leave most of your heavy equipment behind when you start out to photograph brainworkers," advises Bob Fuhring. He ought to know, because as part of his job as story scout, writer, and photographer for the giant industrial public relations firm Carl Byoir & Associates, he regularly covers some of the most abstruse scientific and engineering operations in the country. He has become one of the very few men who can capture that elusive, exciting atmosphere of important brain work getting done, and his pictures frequently wind up in national magazines.

It's sort of ironic, but technicians who spend their working hours surrounded by complex and impressive equipment are the first to freeze up when faced with an innocent tripod-and-lights setup. More important, they generally don't want anyone else's gear cluttering up a probably already cluttered work space. No more hostile to photographers than any other busy people, they do object to anyone who gets in the way—and this goes for company executives as well as photographers.

Just as in animal photography, the first step is to gain the confidence of the subject. This can make or mar the assignment, for the photographer might as well face the fact that a good deal of the time on a highly technical scientific job he will be plain out of his depth—unless he's a Ph.D. and then some—and completely dependent upon friendly scientists to explain to him what's going on.

The easiest way to gain the confidence of the quarry is to convince him first that you're really

TENSION COMPELS ATTENTION ▲

Clutching a Minnesota drumstick—an ice cream cone in other parts of the country—engineer of the Minneapolis Honeywell Regulator Co. hears welcome news: "It may be a breakthrough—number 33 looks good!" This means that after 32 tries at matching components for a rocket-guidance gyroscope so sensitive it will detect one revolution in 200 years one seems to be passing gruelling tests. Tense moment at left occurred when gyro brain was battered on vibrator to see whether it would stand up to shock of rocket launching. Left-hand picture packs great wallop, but gentler humorous shot of engineer and ice cream cone is also important in humanizing the men who are shaping the lives of generations to come.

BRAINWORKERS BRAINWORKING

It's the problem that counts with engineers, whether they are working on a spaceship—as they are in the picture below—or on your household heating thermostat, which Honeywell also makes. Same thought goes into both, for engineering is engineering, whatever the end product. ▼

interested in what he's doing, and second to blend with the background.

There are ways to be out of the way and unobtrusive without looking as though you're really Secret Agent X-9. The first of these is to travel as light as possible, but always make your purpose clear. Fuhring uses a pair of Exaktas, and when it's absolutely necessary will increase room illumination level with photofloods in clip reflectors. Use of the 35mm camera gives him good depth of field, while the eye-level reflex design enables him to compose and focus on the ground glass and thus select his moment for the picture.

ACCENT ON PEOPLE

What sets Fuhring's pictures apart from run-of-the-mill photographs of scientists at work is their emphasis on human qualities while never losing sight of the job the man is doing. In the pictures we have selected the major—and most exciting—point made is that the savants are human beings first and brains afterward. There is nothing of the spooky B-picture scientist about them. They eat ice cream cones, bat the breeze, tell their wives

SCIENTIST ARE HUSBANDS TOO

Another Saturday evening emergency, and another explanation of why this Honeywell engineer couldn't take his wife out to dinner as he'd promised. Catching this little drama as it was about to happen, Fuhring skillfully maneuvered couple under dramatic ceiling light.

MASTER AND PROTEGES

Harvard's Prof. Aiken, father of electronic computers, *left*, visits DATAmatic Corp. to see high-speed commercial computer built by young ex-colleagues, shows he is still top man by posing problem that ties machine in knots.

THE HOME STRETCH

Head in hands, DATAmatic engineer studies fat book of blueprints that add up to electronic brain. This shot required a good deal of climbing over furniture, company personnel were so absorbed in problems that nobody paid any attention to photographer.

they won't be home for dinner—and push the frontier of human knowledge further.

Doing a thorough and meaningful story with many good pictures on an engineering or development project is not the work of an afternoon. The most important thing after an eye for a picture is time. Time to get to know—at least roughly—what's going on, time to make friends with the people involved—for probably no group can freeze out an unpopular stranger more thoroughly than technical men who talk to each other in fluent algebra.

All too human

If you're the brash, breezy kind of photographer who gets along just great with the girls in the packing department, the chances are against your getting top-notch pictures of scientists. They like to be entertained too—and the pictures stop happening. The fact to bear in mind when operating around men engaged in highly technical jobs is that they have enough to think about in their own work without worrying about yours. Actually the same is true for the photographer, except that part of his job is worrying about the drama unfolding before his lens. It doesn't hurt, by the way, to look at a science assignment as something dramatic as long as the scientists themselves get no inkling of the way you feel. Most of them will back away from any starry-eyed approach; one or two will "ham it up" to suit your lurid preconceptions. Either way the true picture of the scientist at work is bound to suffer.

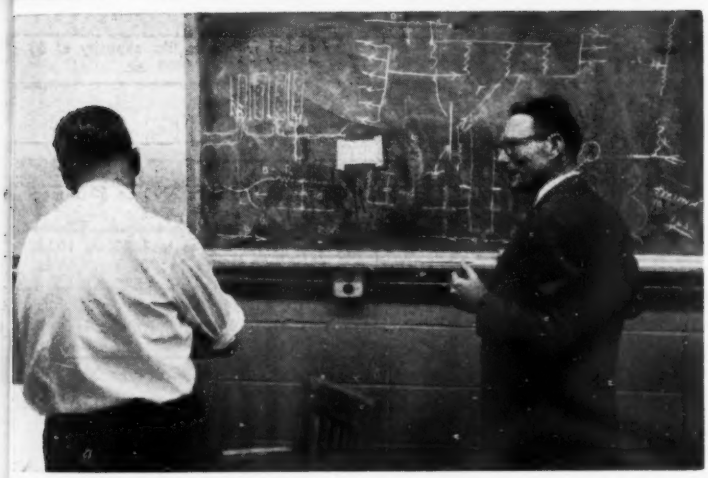
No human being could work under conditions of intense drama every day, and scientists are very human. The drama the photographer will see comes only in fleeting moments; in a gesture or a subtle, tense grouping. The rest of the time scientists and engineers work under the low pressure the rest of us are accustomed to. The photographer who must catch that drama is in the unenviable position of spending most of his time as the tensest man on the scene, for he must be alert to the slightest variation in the emotional climate.

Automatic technique

Fuhring makes a great point of not being primarily a photographer, and that, to a great extent, is responsible for the keen observation and meaningful detail of his pictures. He has streamlined his working methods to the point where he doesn't have to think very much about the technical means of achieving his aims; his technique is the simplest, most straightforward use of available light or bounce strobe. The subtlety comes in the selection of the perfect moment for pressing the button and releasing the shutter.—THE END.

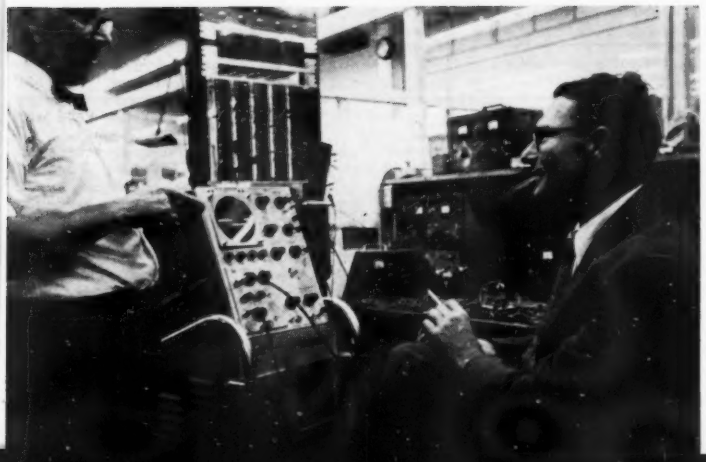
◄ GLIMMER TO GADGET

Eraser in one hand chalk in the other, scientist begins working out complicated circuitry of computer component. After settling main lines of development, he sits down at his desk and works out further details on paper, over a container of coffee. Discussing circuit with colleague, in order to discover possible "bugs" and construction problems, he moves to blackboard again. In last picture, circuit already has been built, and has reached testing stage. Following piece of equipment through from its inception is almost foolproof way of showing how scientist works, but it takes plenty of time and understanding.



BATTING THE BREEZE

Much of theoretical scientific advance is made in the course of discussion among scientists — and there's no law saying this discussion must be grim. Here Republic Aviation Corp. scientists light-heartedly discuss plasma engines and re-entry problem. ▼



PMI's directory of SEQUENCE CA

	FORMAT	PULSE OPERATION	BURST OPERATION
TRAID CORPORATION			
Automax G1	.738 x .97 in. on 35mm M.P.	May be pulsed externally from intervalometer or control units (optional) at 1/64 sec.	To 16 fps, any no. of frames on 100 to 1000-ft. Mitchell magazine. 1/64 sec. (Other speeds optional).
Automax G2	As above	As above	As above
BEATTIE-COLEMAN, INC.			
Beattie Varitron Model D	35mm (15/32 x 1 11/16)	Trigger button or solenoid connection trips camera at 1/50 sec., advances film in ½ to ¼ sec.	None
Model ST-6	As above	As above except film advances in 1 or ½ sec.	None
Model E	To 2½ x 3¾ on 70mm	As above except film advances in 2, 1, ½ or ¼ sec. depending on magazine.	None
BELL & HOWELL CO.			
B&H 200p	16mm 50-ft. magazine	May be pulsed externally from intervalometer (not supplied).	To 8 fps, any no. of frames to 2000. Min. 1/100 sec.
BURKE & JAMES, INC.			
2501R Recording Camera	35mm M.P.	Trigger button or optional electrical connection actuates 1/30 sec. exposure in 1/3 sec. pulse cycle.	None
2508R	35mm M.P.	None	Camera operates as strip unit 3 in. to 3 ft. per sec. or with standard shutter at ½ to 1/100 sec.
CANADIAN APPLIED RESEARCH, LTD.			
T232 MK 7A	35mm M.P.	Remote control trips 1/200 shutter, advances film in 1/7 sec.	To 6 fps, any no. of frames on 100 or 400-ft. magazine at 1/200 sec.
T232 MK 7	35mm M.P.	Remote control trips 1/100 sec. shutter, advances film in 1/3 sec.	To 3 fps, any no. of frames on 100 or 400-ft. magazine at 1/100 sec.
FAIRCHILD CAMERA AND INSTRUMENT CORP.			
K-25 Press Sequence	4 x 5 on 5¼ aero roll	Trigger button trips camera at 1/125, 1/200 or 1/500 sec., advances film in 1/3 sec.	To 3 fps, any no. of frames to film capacity of 50 frames, at 1/125, 1/200 or 1/500 sec.
Toll Booth Camera	.292-in. sq. on 16mm M.P.	Trigger button or remote trips 1/50 sec. shutter, advances film in 175 milliseconds.	None
FLIGHT RESEARCH, INC.			
Multidata III B	16mm M.P.	May be pulsed remotely to 10 fps. Variable focal-plane shutter.	To 80 fps, any no. of frames to 2000 on 50-ft. magazine at 1/12 to 1/5000 sec.
Multidata IV C	35mm M.P.	As above	4 to 80 fps, any no. of frames to 1600 on 100-ft. internal magazine at 1/12 to 1/5000 sec.
GORDON ENTERPRISES			
190 GE	35mm M.P.	Trigger button or internal intervalometer trips shutter at max. of 1/400 sec., 4 fps.	4 to 64 fps, any no. of frames to 3200 on 200-ft. magaizne at min. of 1/400 sec.
63 GE-CG 4	16mm M.P.	Trigger button trips shutter at 1/100 to 1/200 sec. Max. 3 fps.	Max. 3 fps, any no. of frames to 800 on 20-ft. film at 1/100 or 1/200 sec.
188 GE	35mm M.P. or 70mm	Remote intervalometer trips shutter variable from 1/50 to 1/150 sec., advances film in ¼ to ⅛ sec.	None
F 1013 GE	35mm M.P.	Trigger button or remote intervalometer trips 1/50 sec. shutter. Max. of 5 fps.	4 to 16 fps for entire 400-ft. load at 1/50 sec. regardless of frame speed.
187 GE	5-in. sq. on 5¼-in. roll	Trigger button or remote trip for shutter options of 1/150, 1/450 or 1/900 sec. Max. 5 fps.	2 fps to 1 frame per 120 sec. at 1/50, 1/450 or 1/900 sec. 125 exposures max. per burst.
189 GE	16mm M.P.	None	Up to entire film load (100 ft.) at 2 fps, 1/24 sec. exposure.
184 GE	5 x 7 on 5¼-in. roll	Manual trigger or solenoid trips 1/200, 1/400 or 1/600 sec. shutter. Max. 1 frame per 3 sec.	To 36 frames per burst from 1 frame per 3 sec. to 120 sec. 1/200, 1/400 or 1/600 sec. exposure.
CA-7C	4 x 5 on 5¼-in. roll	Manual trigger or solenoid trips 1/25, 1/250 or 1/500 sec. shutter. 1 fps.	To 50 frames per burst at 1 fps. 1/25, 1/250, 1/500 sec. exposure.
186 GE	9 x 18 in. on 9-in. roll	Manual trigger or solenoid trips 1/50, 1/100 or 1/150 sec. shutter. Max. frame rate: 1 per 3 sec.	To 245 frames per burst from 1 frame per 3 to 120 sec. 1/50, 1/100, 1/150 sec. exposure.
64 GE	2¼ sq. on 70mm	None	To 100 frames at 1 fps. 1/150, 1/275, 1/400 sec.

E CAMERAS

TEXT AND KEY, *page 88*

MOTOR	LENSES	*WEIGHT	*PRICE	NOTES
28V DC	Eyemo lens mount, std. Leica mount, optional	12 lbs.	$1785	Compact boresight camera "designed primarily to withstand the punishment of aircraft flight testing." Many accessories available. 459.†
As above	As above	As above	1960	As above (except no double frame format modification) plus illuminated panel to record counter, slate and clock on each frame of film. 460.
28V DC or 115V AC	Recessed Exakta mount.	On request	580	Camera consists of four sets of interchangeable units—camera unit, shutter, data recording back and film magazine (100-ft.). Features ground glass focusing and options including data chambers. 461.
115V AC	As above	On request	225	Camera consists of interchangeable magazines in various formats for basic body. Ground glass focus. 462.
28V DC or 115V AC	Universal lens mount	On request	715	Similar to Model D above except units are designed for 70mm film; special magazines accept 35, 46 and 70mm film. 463.
24-32V DC solenoid (built in)	"C" mount	2 lbs. 10 oz.	300	Camera features built in, thermostatically controlled heater. Shutter remains open for duration of pulse. Uses 3-pin AN connection, modified Kodak or Ansco 50-ft. magazine. Finder optional. 464.
Spring motor or solenoid (optional), or 115V AC motor (optional)	25mm B&H Eyemax	6 lbs.	399.50 w/lens	Bell & Howell camera modified with lever release interlocked to permit only one exposure at a time. A no. 2502 R has 2-in. f/2.8 lens. Both accept 100-ft. daylight spools. 2503 R accepts magazines. 465.
As above	50mm f/2.8	8 lbs.	445 w/lens	Bell & Howell camera modified. 100-ft. daylight load spools. Other lenses, 400-ft. magazines available as options. 466.
28V DC	28mm Angenieux f/3.5	13½ lbs.	On request	Camera has fiducial marker and frame counter attachment. Intervalometer and control units available. Slower speeds obtainable. 467.
28V DC	As above	13½ lbs.	On request	As above plus interchangeable apertures for single frame, double frame or square formats. 468.
28V DC twin motor	6⅜-in. Kodak f/4.5	11 lbs.	850 w/lens	Hand-held camera with power pack; has wire finder frame, counter, focal-plane shutter. 469.
Solenoid	W.A. f/1.5	12 lbs.	On request	Designed for documenting highway toll booth operations, camera has automatic photoelectric cell exposure control, records time to minute, event number, code lights & cards. 470.
Interchangeable 28V DC and AC motors	Number of lens mount options	On request	1100	Regularly supplied with two fiducial markings for center of picture and two independent code lights. Many options. 471.
As above	As above	On request	2850	As above plus two additional fiducial markings and external magazines to 1000-ft. film capacity. 472.
24V DC	Three-lens turret mount	20 lbs.	On request	Intervalometer is integral part of camera as is a heater controlled by thermostat. Has built-in critical focusing device. 473.
28V DC	35mm Anastigmat f/3.5	1¼ lbs.	On request	Integral right-angle prism incorporated as part of camera optics; focal-plane shutter; removable film magazine. 474.
28.5V DC	Flange mounted optics available	12 lbs.	On request	Remote control box and intervalometer supplied as part of camera set. Ground glass focus. Data recording chamber. Takes 35mm or 70mm 100-ft. daylight or 200-ft. darkroom load. 475.
24V DC	Mitchell mount	30 lbs.	On request	Time base recording on film (optional). Operates −60 to 160°F at altitudes to 60,000 ft. 476.
24V DC	6⅜ f/4.5 lens	46 lbs.	On request	Camera has focal-plane shutter, focusing lens mount, interchangebale daylight loading magazines. 477.
28V DC	"C" mount	8 lbs.	On request	Special application time base recording available. 478.
24V DC	40-in. telephoto f/8	48 lbs.	On request	Regularly supplied with appropriate intervalometer. Accessories available. 479.
24V DC	15-in. telephoto f/5.6	30 lbs.	On request	Behind lens shutter. Intervalometer & fiducial markings optional. Daylight load 20-ft. mag. 480.
24V DC	24-in. f/6	125 lbs.	On request	Fiducial markings permanently located on film magazine. Intervalometer regularly supplied. 390-ft. max. film length. Between lens shutter. 481.
24V DC	75mm f/4.5	5½ lbs.	On request	25-ft. max. film length. Special optics available on request. 482.

**approximately* *† reader's service no.; see page 88*

continued on the following page ▶▶▶

SEQUENCE CAMERAS *(continued)*

CAMERA	FORMAT	PULSE OPERATION	BURST OPERATION
GRAFLEX, INC.			
Graphic 70	56 x 72mm on 70mm	Manual trigger, 9 speed shutter to 1/500. Up to 10 sequence shots.	None
CHARLES A. HULCHER, INC.			
Hulcher 70 102	2¼ x 2½ on 70mm	Trigger button or remote cable trips shutter, advances film in 1/5 sec.	To 470 frames per burst at 5 to 20 fps (30 fps optional) from 1/25 sec. to 1/2880 sec. exposure.
Hulcher 70 101	2¼ sq. on 70mm	As above	To 5,000 frames per burst at 20 to 75 fps. From 1/60 to 1/5400 sec. shutter.
Hulcher 70 100	2½ or 5 x 2¼ on 70mm	None	To 4,700 frames per burst at 10 to 50 fps. From 1/340 to 1/1200 sec. shutter.
J. A. MAURER, INC.			
Maurer P2	2¼ sq. on 70mm	Remote pulse fires shutter, advances film in 182 milliseconds.	Burst fires up to entire magazine at 5½ to 6 fps.
Maurer 220	As above	As above	As above
Maurer P220	As above	As above	As above
NATIONAL CINE EQUIPMENT, INC.			
"Magic Eye"	24 x 36mm on 35mm M.P.	Electric switch trips 1/50 to 1/400 sec. shutter at 1 fps or 100 fpm.	From 12 to 64 fps. Exposes up to entire film capacity at 1/50 to 1/400 sec.
NIKON, INC.			
Nikon SP	24 x 36mm on 36 exposure 35mm	Trigger button or remote trips 13-speed shutter, motor advances film at 1/3 sec.	To 36 exp. at 3 fps. 13 speed shutter (top speed 1/1000 sec.)
Nikon S3	As above	As above	As above
OPTOMECHANISMS, INC.			
131	2 11/32 sq. on 70mm	Solenoid trips shutter on "T" advances film in minimum of 25 milliseconds.	(Option) burst at 1 to 40 fps up to magazine capacity at 1 to 1/10,000 sec. exposure.
EARL PRITZ, INC.			
Robot Star	24 x 24mm on 35mm	Trigger or solenoid trip, 9-speed shutter, motor advances film	Sequence remote release fires burst up to 24 frames (54 with double motor) up to 2 fps at 1/50 to 1/500 sec.
Robot Royal 24	24 x 24mm on 35mm	As above	As above except burst release is built in—plus burst rate to 6 fps.
Robot Royal 36	24 x 36mm on 35mm	As above	Sequence remote release fires burst to 36 frames with double motor to 6 fps to 1/500 sec.
Robot Royal 36a	24 x 36mm on 35mm	As above	As above plus electric motor option.
Robot Royal 24a	24 x 24mm on 35mm	As above	As above
Robot Royal 18a	18 x 24mm on 35mm	As above	As above
Robot Recorder 36	24 x 36mm on 35mm	As above	As above
Robot Recorder 24	24 x 24mm on 35mm	As above	As above
Robot Recorder 18	18 x 24mm on 35mm	As above	As above
PACIFIC LABS			
V-10	35mm M.P.	Trigger or solenoid trip 1/64 sec. shutter, auto advance of film in 1/10 sec.	Burst at 16 fps up to entire magazine load at 1/64 sec. shutter speed.
M-35	35mm M.P.	Trigger or solenoid trip 1/96 sec. shutter, automatic advance of film in 1/10 sec.	Burst at 24 fps up to entire magazine load at 1/96 sec.
PHOTO SONICS, INC.			
35mm 4A	35mm M.P.	Manual or remote trip of disc shutter, automatic advance of film in 1/12 sec.	Burst at 1 to 12 fps up to entire 6400 frame capacity. Shutter speeds 1/36 to 1/8000 sec.
STANDARD CAMERA CORPORATION			
Praktina FX	24 x 36mm on 35mm	Trigger button, solenoid or radio remote trips 13 speed shutter, Automatic advance of film in 3/4 sec. (1/3 sec. with spring motor.) Top speed 1/1000 sec.	None
A. S. F. PHOTO EQUIPMENT CO.			
Portramatic 350	70mm to 105mm	Trigger button or remote switch trips 1 to 1/150 sec. shutter advances film in 2 sec.	None

MOTOR	LENSES	*WEIGHT	*PRICE	NOTES
Spring-wound	4-in. Ektar f/2.8 & accessory lenses	5 lbs.	1,850 with lens	Similar in design to 35mm still cameras. Takes 50 exposure cartridge. Rangefinder. Focal plane shutter .483†
12-28V DC or 115V AC	6 3/8-in.	12 lbs.	1,375	Remote control supplied with pulse operated camera. Timing mechanism, fiducial marks and two timing lamps available as extra. 484
115V AC	On request	45 lbs.	6,250	Remote control standard. Fidicial marks, two timing lamps standard. 485
28V DC or 115V AC	On request	40 lbs.	3,500	21° exposing shutter. Other shutter discs available. Two formats. 100, 400 or 1,000-ft. magazines. 486
24-28V DC	76 or 80mm	On request	On request	Shutter has T, B, 1/500, 1/100 and 1/200 sec. 1/100, 1/200 and 1/500 combination available if specified when ordering. Fiducial marks standard. 15, 50 or 100-ft. magazines. 487
As above	38 to 300mm	On request	On request	As above.
As above	As above	On request	On request	As above, plus photo cell automatic diaphragm control. 488
12V or 24V DC or 110V AC	18mm to 40-in.	On request	800	Rackover or direct focusing. A custom-modified motion picture camera with many options including 100, 400, or 1,000-ft. film capacity. 489
9VEM 1 motor and power pack	16 Nikon lenses available	3 lbs.	569 with lens	Nikon SP 35mm camera is converted into sequence unit by replacing back with EM1 motor which adds 1 in. to height of camera and nothing to other dimensions. Motor and dry cell power pack add 1 lb. to camera weight. Price includes motor, 50mm f/1.4 lens. 490
As above	As above	As above	509 with lens	As above except camera unit is Nikon S3. 491
Motor driven spring drive	On request	28 lbs.	On request	Remote control unit furnished. Special periscope permits direct viewing during shooting. 492
Built-in spring motor	On request	On request	79	Double-spring motor (optional, must be specified when ordering) for 54 frame burst. X-sync at all speeds. Special cassette opening when back is closed. Price without lens or accessories. 493
Built-in spring motor	On request	On request	189	As above, plus built-in rangefinder. 494
Built-in spring motor	On request	On request	159	As above, plus built-in rangefinder. 495
Built-in spring motor plus optional electric booster motor.	On request	On request	159	As above, plus optional booster motor and 30 or 200-ft. magazine. 496
As above	On request	On request	189	As above, plus optional booster motor and 20 or 200-ft. magazine. 497
As above	On request	On request	209	As above, plus optional booster motor and 30 or 200-ft. magazine. 498
As above	On request	On request	169	As above. 499
As above	On request	On request	149	As above. 501
As above	On request	On request	149	As above. 500
24V DC	35mm Summaron f/3.5	11 lbs.	1,775	Alterations (specified in advance) offer shutter options 1/40 to 1/1000 sec. with frame rates to 48 fps. Many options and accessories. 502
24V DC	35mm Summaron f/3.5	6 lbs.	690	Alterations (specified in advance) offer shutter speeds to 1/1440 sec. and frame rates to 48 fps. 100 to 400-ft. load. 503
220V AC or DC	On request	25 lbs.	10,000	Price less lens includes control box, data box and drive motor. Boresight viewing at 10X. Data equipment includes resettable frame counter, 25 lamp timer and slot for data card (all recorded on film). 504
12V DC or 115V AC or spring motor	20 lenses available	4 lbs electric motor 3lbs spring motor	390 with lens	Price and weight include camera, lens and motor. Camera is 35mm single-lens reflex, with built-in direct viewer. Change of motor requires no adaptation of camera. Many accessories available including 50-ft. bulk film magazine. 127
115V AC	10-in. anastigmat f/6.3	On request	1,345 with lens	Basically a continuous strip portrait camera. Unit has matched pair of lenses for ground glass focusing. Identification device available. Many options in lenses, frame sizes and magazine capacities available. 128

approximate †readers' service no. see page 88 for details

PMI's Monthly

READERS' SHOWCASE

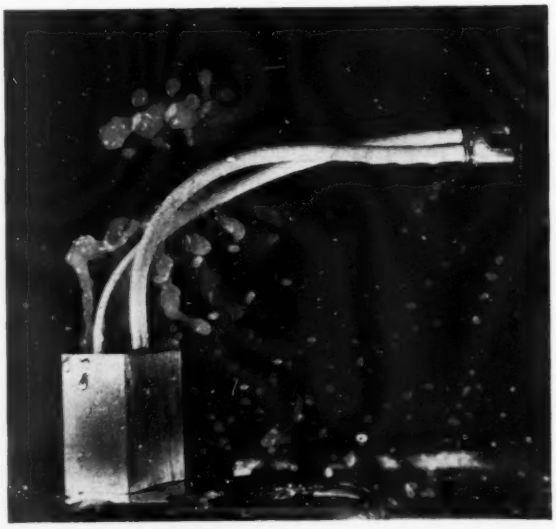
Five of PMI's readers supply pictorial solutions to industrial photo problems.

Working with Readers' Showcase is a pleasant experience. You get to look at the cream of a lot of fine photographer's work, you confer with the other editors and the art director about which pictures to use and you make out check requests. Rewarding, sociable and you spend somebody else's money. But there's a fly in the ointment. Judy, she's the one who sends out the checks, storms in. Tears of rage burning on her cheeks. She chokes, "Where do I send this blinking check?" We consult. Phone books, Thomas' Register, finally track down address. Judy exasperated, you're weak. For Judy's sake put address to which you want check sent on back of print. In this month's offering photo tricks leavened the assignments. W. Leon Reigler used a reproduction technique for his extraordinary portrait. For Frank Bauer, skilled lighting did the trick. Ed Nowak tried a night-time double exposure. Noble D. Carlson used multiple exposures and R. S. Johnson played the angles.

You are invited to send in your pictures for this feature. Here are the details:

There are two rewards for each of the pictures chosen. The first is knowing that your picture will be seen by appreciative fellow professionals. The second is $10.00. Please include your name and your company's name, a note about the picture and how it was used, and the technical data. Send them to SHOWCASE, PMI, 33 W. 60, New York 23, N. Y.

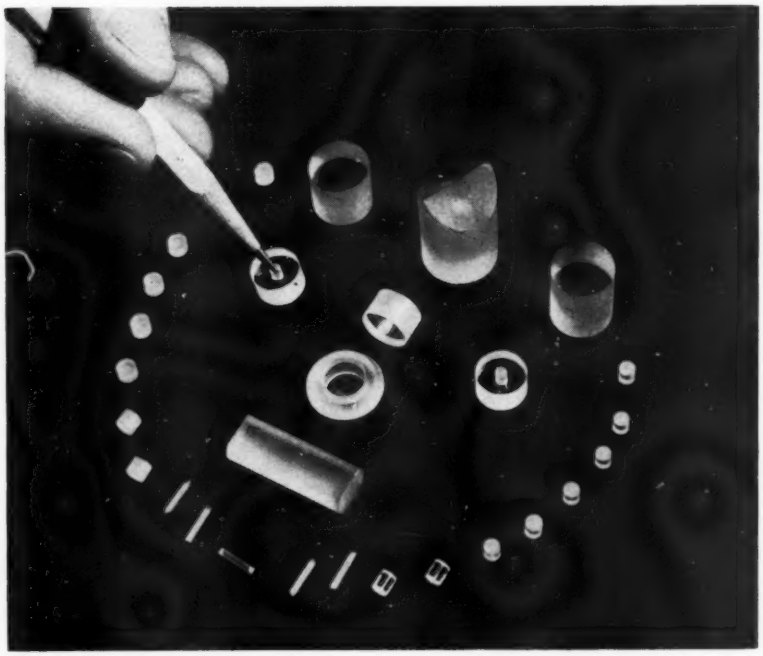
ED NOWAK, New York Central Railroad, New York, N.Y., worked out the idea for this dramatic shot of a new self-propelled diesel passenger coach with the Central's publicity department. He used a 4 x 5 Speed Graphic, 5-in. lens, fast pan film, exposed the picture for 10 sec. at f/8 to record car lights, continued exposure for 6 sec. as the car slowly got under way.



NOBLE D. CARLSON, PDA Advertising Agency, Cleveland, Ohio, used a photo device of his own invention for this picture. It demonstrates that a component of a client's product is waterproof. Royal Pan film, a series of 1/7500 sec. exposures 1/80 sec. apart.

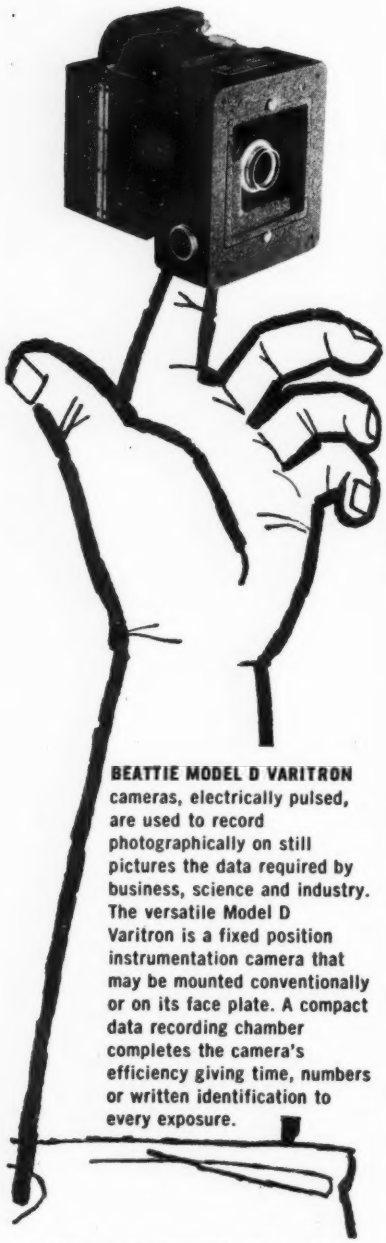
W. LEON REIGLER, The Upjohn Company, Kalamazoo, Mich. made this line portrait to illustrate a job-change story in a company publication. Reigler used an Eastman 8 x 10 view with a 5 x 7 reducing back to make the original negative, then reverted to darkroom trickery for his steel-engraving effect. The method is described in full in *Kodak Tone-Line Process,* a Kodak publication. It consists of making an unsharp 80 per cent positive mask of the original negative, sandwiching the positive mask and negative to make a print on contrast film or paper.

R. S. JOHNSON, Ford Motor Company, Dearborn, Mich., had himself a field day when assigned to make pictures of Ford Great Lakes ore fleet. This is one of the many fine results. Johnson used a Speed Graphic with a 90mm wide-angle lens, 4 x 5 Royal Pan film. Exposure was f/11 at 1/100 sec.



FRANK H. BAUER, a St. Albans, N.Y., free lance, made this illustration of Union Carbide Corp. parts for trade magazine advertising. The small units are transparent on some faces, translucent on others. Trick was to show off their gem-like light-transmitting properties, show scale and eliminate shadows that would confuse the issue. Bauer subtly lit his setup with a flood, a 500W spot and a baby spot, avoided shadows with a black rubber-cloth background that set off the highlights of the subject in rich contrast. Tri-X film, 4 x 5 Graphic View, 150mm Bausch and Lomb lens 4 sec. exposure at f/32.

Reaching for a better way to read and record industrial data?



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by Ernest E. Reshovsky

PHOTO INSTRUMENTATION

Synchronized cine-and-sound-tape camera suited for automation use

It was not very long ago that magnetic striping of motion picture film made quite an impression on the sound-on-film fraternity. To recap: The process involves the adding of a magnetic edge stripe to motion picture film, either before or after the film is processed. In either case the end result is sound-on-film, with the sound being reproduced through a magnetic pick-up in the projector.

Cameras were produced which could utilize film which had been pre-striped and these cameras recorded sound on the magnetic stripe by means of a magnetic recording head incorporated within the camera itself.

How far the art of magnetic recording on motion picture film has progressed can be gathered from the recent announcement of a data-recorder which combines synchronized data—electric, visual and audio—on 16mm motion picture film, which has been pre-striped for upwards of ten sound-on-film magnetic tracks. This data recorder, which has been named Datasync, only weighs 35 lbs. and is able to perform all sorts of tasks.

Gives orders, too

Basically, the Datasync is a 10 channel hi-fi magnetic tape recorder which also takes 16mm motion pictures. As such it packs a large quantity of data into its single-system film and magnetic brain. As speech is lip-synched on a TV screen or a movie projector, so does this data recorder synchronize electronic and audio data with its visual picture. As a matter of fact, the recorder can give commands as well as take them. In industry a process can be programmed and pre-recorded on one of the robot's magnetic tracks and the recorder will call out each process step, vocally as well as electronically—film the process in either black-and-white or color motion pictures—read meters, graphs or gauges —record analog and digital information—store complex wave data from cathode ray tubes—transcribe intercom talk between technicians—and synchronize it all on film and tape. Minutes later the data can be

played back for scientific study and appraisal, the motion picture film having been quick-developed.

Good memory

The Datasync holds 1200 ft. of film: Recording at 24 fps (7.2 in. per second) it can run continuously for 33 minutes before re-loading. During this time it can record up to 240 million cycles of analog or digital information synchronized with the 48000 movie frames.

In action, the recorder's lens (any focal length can be used, depending on the need) takes a conventional motion picture on 16mm film. Synchronized with the picture its magnetic tracks are fed the instrumentation signals, with the feed-in unit either remotely located or plugged into the front of the camera. The signals, amplified and impedance-matched, feed into the recording heads located within the camera.

Sapphires easy on film

The camera controls are all designed to be operated from front, to allow it to be installed in a corner; it has two viewfinder-focusing lenses, one on each side of the camera; the footage counter can be set in any

of 12 positions to make it readable from all angles. The film gate is inset with 13 polished sapphires to prevent a pile-up of emulsion during a run. It has been found that during a 1200-ft. run even microscopic amounts of emulsion in the film gate blur focus, i.e. an image filmed at 10 ft. through a 1-in. lens at f/1.9 is thrown noticeably out of focus if as little as 1/1000-in. of emulsion collects within the gate.

An interesting feature of the Datasync is the fact that it can be remotely controlled. Remote indicator lights showing the remote operator whether the camera is ready to "run," or is "running." A red warning light shows if the film is not threaded correctly, the take-up mechanism is not functioning, the magazine is not loaded or the camera door is not closed. Berndt-Bach, Inc., 6914 Romaine St., Hollywood, Calif., makes the Datasync.

New magazine can take it

Recovery of photographic records after a crash or drop from an experimental aircraft or a missile is one of the problems encountered by instrumentation photographers. Interesting tests were done recently with a CEC 5-032 oscillograph magazine, made by Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif.

To check for shock resistance, heat resistance and other hazards liable to be encountered, the magazines were first subjected to a "fire bath" of 2000° F. Two thermocouples were placed inside the magazine—one on the empty spool and the other on the inside of a roll of exposed recording paper. After the test the magazine was opened, the paper removed and upon development was found to contain a perfectly usable record. Fire resistance is obtained from the fact that the magazine is housed in a ductile iron casting, surrounded by a stainless steel shell. The space between the two is filled with foamed silocone resin for insulation. The outer shell is coated with paint which foams at 300° F and forms a thick insulating layer. The shock tests checked the magazine up to 400-g impact, with the duration of the shocks ranging from four to five milliseconds. The shock tests consisted of a free fall onto lead slugs, with the magazine fastened to a jig weighing approximately 800 lbs. Various g-loads were obtained by varying the height of the drop. The shock load was measured with an accelerometer mounted on the jib. At 400-g's the contents of the magazine were still found to be well protected.—THE END

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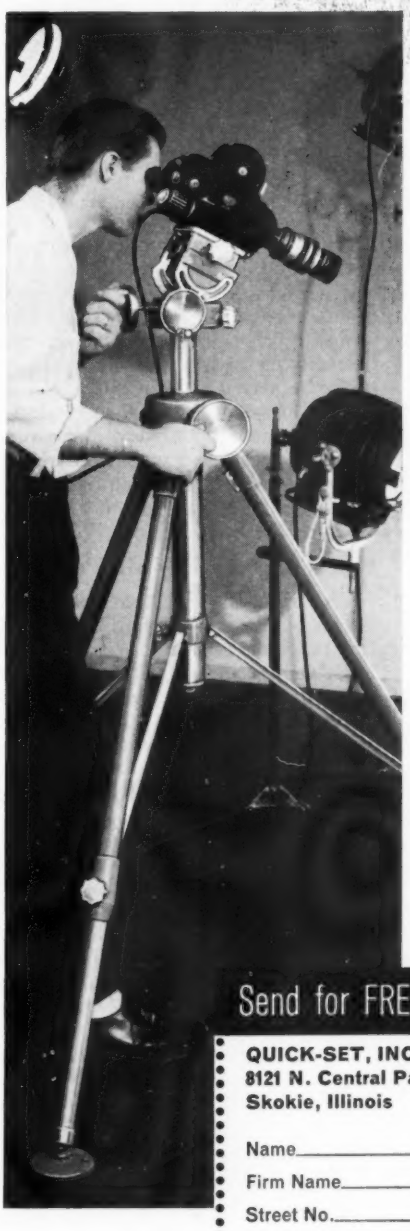

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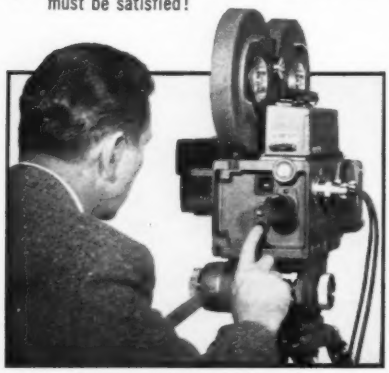

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Get more information. Circle 407, page 91

by Arnold Eagle

INDUSTRIAL MOTION PICTURES

Eagle explains film editing routine: not difficult, needs care

Film editing demands taste, judgment, experience and imagination—as I discussed last month. Film editing procedure, however, is a system. Most of the rules can be learned by rote, and they are practically standard wherever film cutting is done. The rules are extremely important, even if simple-sounding.

The first rule is to work in an easy-to-clean and relatively dust-free room, with adequate equipment—basically consisting of an editing table, an action viewer and a splicer set up between two 2000-ft. rewinds, storage space and a supply of white cotton gloves, used whenever film is handled. (Most of the equipment is available for rental, *see chart, pages 68 and 69.)*

Procedure, step by step

The first task of a film editor is to delete blanks and the bad takes from the original film as it is returned from the processor. This is greatly simplified by accurate camera reports, made on printed forms during shooting. Anything reported "Scene 1, Take 2, no print," or equivalent tells the editor he is to locate the shot in the original and remove it. Without a camera report or with an inaccurate camera report, the editor has a mess on his hands. But it's his job to trim out the failures, wind the remainder of the original on plastic spools and send them to the lab for edge numbering (printing accurately spaced consecutive numbers on the edge of the film) and a work print. The edge number automatically appears on the work print.

Edge numbering is one of those very simple but very important matters. Its small cost is a very worthwhile investment, as any editor will find later when he has a scene three feet long and tries to locate it in 6000 feet of original material.

When the work print is returned from the lab, it's usually best to project it for everyone directly concerned with the film before further cutting is done. While the work print is on the screen, the editor watches it and keeps notes on what looks good, bad or indifferent and what necessary material is missing. Others concerned with the film have the opportunity at this point to discuss with the editor how close the film hews to the script, any further material that will be secured and the general line to which the editing should adhere.

The next job is cataloging the work print. The editor lists and enumerates each shot and indicates which edge numbers it includes. At the same time he cuts the shots apart and labels each with a grease pencil or gummed label. He then coils the shots and hangs them in sequence on a peg board; or suspends them from numbered hooks into an editing barrel, an actual plastic barrel or an ample, clean sack.

Following this he assembles the shots in an order that follows the script, and begins his rough cut. The editor changes shots about, eliminates some, shortens others (always allowing enough frames at the head and tail of each shot for matched cuts and leeway). If the editor damages so much as a frame, he substitutes a piece of leader so that ultimately each shot will match the original frame for frame. Finally he assembles the whole business in the rough cut—the tentative form of the motion picture. The rough cut must make sense and tell the story, albeit not smoothly and at greater length than the ultimate film. The rough-cut work print is projected and reprojected until the editor, producer and director have agreed on eliminations, changes and the final running time of the film.

In the final cutting, the editor makes these changes. He trims the shots to their final length, with careful precision where action is to be matched or optical effects are in tended. Each scene is measured with

a timer or a footage counter.

Meanwhile the symbols for optical effects such as fades, dissolves and wipes are made in grease pencil on the work print. These symbols vary somewhat from laboratory to laboratory, but most labs have a chart showing how each should be handled and are glad to supply it for the editor's wall. The charts usually contain other information as well, including the correct length of the leader. This information is also contained in *The American Cinematographer's Handbook*, available through Amphoto, 33 W. 60th St., New York 23, N.Y.

Optical sound is then synchronized to the film. Really a subject in itself, space permits only the briefest description of it here. Studios use a sound reader or a Movieola which accommodates the work print and one or a number of films containing location sound, narration, music and sound effects. All of them run through in unison. These separate sound tracks are finally intermixed into a single film which is again synchronized to the work print.

Save original till last

In the last stage of his work, the editor matches the original frame-for-frame to the work print on a synchronizer. Actually this may or may not be part of the editor's job since most labs offer a cutting service. The budget allowing, it may be well to rely on these services. If optical effects are involved, the original is divided into two rolls, called A and B. In the case of a dissolve, one overlapping scene occupies a position on the A roll, while the second scene of the overlap occupies a corresponding spot on the B roll. Black leader fills in on one roll where the other roll alone is to print. In printing, one roll goes through the printer first. Then the print film is, so to speak, double exposed to the second roll in perfect register. Of course, the only actual double exposure is in the dissolve discussed above. The sound track is also added in the optical printer.

At this juncture the film editor's job is done, but there are some allied tasks to be performed. The first print, the answer print, is screened and alterations in print corrections are called for before further prints are made. When the prints are finished, each is inspected for flaws. A black leader is attached to the end of the film, and the word "tail" is scratched on it. The film is rewound, ready for projection and white leader is attached to the front end. The white leader facilitates labeling the film with its title, pertinent information and the word "head."—THE END

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by Samuel Lang & Leonard Zoref

INDUSTRIAL COLOR

It's still Dye Transfer for best control—from color negatives too

In the stir over negative-positive color, one aspect of the system is often overlooked. Almost excluded from the literature on the subject is mention of Dye Transfer prints made from Ektacolor or Kodacolor negatives.

Actually the Dye Transfer system is eminently compatible with negative color films and it deserves attention.

Dye Transfer work with negative originals differs slightly from Dye Transfer work with transparency materials. It is basically simpler because one step is eliminated when you produce a Dye Transfer print from a color negative. The matrices that ultimately bear the dye in Dye Transfer are printed directly from the camera film. The intermediate step of making color separation negatives is sidestepped.

It is still necessary, of course, that you end up with three matrices, one apiece for the three primaries in the original scene. But the color filter separation is done while exposing the matrix film. It is impossible to do this separation with the old Dye Transfer Matrix film, which required no more color sensitivity than ordinary printing paper because it was printed from monochrome separation negatives. To adapt the system for negative color, Kodak introduced Pan Matrix film some time ago.

Here's how it works. You print your color negative on three sheets of Pan Matrix film, exposing in turn through red, green and blue separation filters. You develop the matrix film in a tanning developer. Then you place the matrix in a dye complementary in color to the exposing filters. The red filter matrix goes in the cyan; green filter matrix in the magenta and blue filter matrix in the yellow. At this point, the process is Dye Transfer, no different from the process that has been so important in color photography for years.

Why undergo the complications of this process? Matrices offer you controls of each color to an extent not possible with Ektacolor paper. You can control the contrast of each of the colors by adjusting the acidity of any or all the dyes. Additional controls are possible in the first rinse before the transfer operation. Adding 20 per cent acetic acid to the dye increases the dye saturation noticeably. A 10 per cent solution of 2,2′,-2″ Nitrolotriethanol in the dye decreases saturation noticeably. A 5 per cent solution of sodium acetate added to the first rinse lightens the color held by the particular matrix. Highlight stain can also be controlled by using .001 Calgon solution.

Dodging the matrix or using color correction masks or overlays on the negative offer you locally controlled color correction—and once you've hit the right combination your matrices automatically repeat it every time. A register negative carrier in your enlarger permits you to use negative masks for a portion of exposure only if you so desire. And you can make local corrections even after the matrices are produced. You selectively add dye with a brush to any portion of the matrix.

Furthermore, the white base of Dye Transfer is comparatively whiter than Ektacolor paper, important to the brilliance of the print, and several paper surfaces are available: single- and double-weight glossy and a double-weight matte. Dye Transfer is far from being a cure-all but it is the answer to many a difficult negative. At present, Dye Transfer is definitely the retouchers' choice because the prints can be bleached with relative ease.

A very successful combination we have been using is to submit proofs on Type C paper and to follow up with Dye Transfer reproduction print. This way we get economy and speed at the layout stage with quality as an end result.—THE END

DISTURBANCE PHOTOGRAPHY

(*continued from page* 19)

To get around this problem, double concave (front surface) parabolic mirrors are used to minimize all of these optical difficulties. Since light is reflected from the surface of these mirrors and does not have to pass through lenses, photographs are not affected by optical quality of the glass; chromatic and spherical aberrations are also eliminated.

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—THE END

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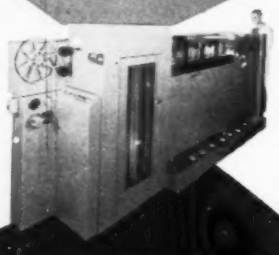

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by Edward R. Farber

ELECTRONIC FLASH

How to rate the speedflash for its photographic capabilities

Our last two columns discussed the physical and electrical characteristics of portable flash units. This month we will examine their photographic characteristics.

It may seem strange to evaluate attributes in that order, but it's impossible to rate picture performance without the basic technical background of the last two columns.

How much light do you really need? Even if you have some definite idea as to the amount of light you really require (and are willing to pay for and carry about), it's not easy to compare units in this respect. Though the manufacturers guide numbers may be perfectly honest, a difference in reflectors may confound the whole comparison. This is why the energy in watt-seconds is of some assistance. Watt-seconds tell the energy stored and available to the flash tube; watt-seconds tell what the flash unit is capable of doing and something about what you get for your money.

Watt-sec.: valid measure?

Since most flash tubes used in present production portables are highly efficient, a given number of watt-seconds results in about the same amount of light *output*. It is true that there may be losses in cords and plugs or even inefficiencies in capacitor design but generally these differences are only ten per cent or so, small enough that they may be practically disregarded.

Watt-seconds alone principally determine the total light output—the amount of light emitted from the bare lamp. Reflectors determine the distribution of this light, a factor that can't be represented simply with numbers.

What happens when we measure the light with the reflector provided? By metering the center of the beam we get BCPS—beam candle power seconds. By measuring both at the center and at various distances from the axis of the reflector (according to the ASA formula for evaluating photographic reflectors) we get ECPS—effective candle power seconds. The first method gives very high ratings to the hot reflectors with very narrow beams, so is not the complete story. The second method, though better, still permits certain reflector patterns to be weighted in favor of high guide numbers, which may be spurious for your own purposes.

Compare all the ratings given by the manufacturer including the reflector beam angle or the point where the light falls off to 50 per cent of that at the center of the beam. Then take the unit and test it yourself.

Flash test

Find a PATTERNED wall (brick, block or wallpaper for example). Use a lens of the widest angle you expect the reflector to cover. Make some tests at f-stops wider and smaller than the recommended guide number. Develop them to normal contrast. Choose the best ones, being sure that the negative has not blocked up at the center of the beam, and the light covers the negative satisfactorily to the corners. Your own guide number, figured by multiplying the distance in feet by the f-number used with the best negative, is the one to go by.

Naturally you would make this test with the various focusing positions if the reflector is of that type. Be sure to use your favorite film and your usual developer. If most of your work will be with color, make the test with color film. It has less latitude so unevenness of light distribution may cause serious underexposure at the corners.

These tests assume that we are shooting speedflashes with the light on the camera. When we take the light source from the camera, a much greater beam angle is required because of the aiming problem involved, especially when you hold the light source while sighting the camera on the subject.

A reflector with a narrow beam angle needs to be backed away from the subject in order to cover a given area, and high stands are required to maintain a suitable angle of illumination.

Don't forget, it always takes a definite amount of light to illuminate a definite area. If 100 watt-seconds will illuminate an area 5 ft. in diameter at f/11, 200 watt-seconds will illuminate only a 7-ft. circle at that same intensity. It will take 400 watt-seconds to identically illuminate a circle 10 ft. in diameter. So don't be misled by fantastic guide number claims. Investigate for yourself.

Light quality

One additional problem: the so-called "quality" of light. Polished reflectors give a definitely harsher black-shadowed illumination. Diffuse reflectors tend towards softer, more open shadow results—with the penalty of lower guide numbers. The advantage is better, easier to print negatives when the flash is aimed directly at the subject.

Flash durations of most portables are certainly satisfactory for stopping ordinary human action. Most manufacturers rate speeds at one half or one third peak, which gives a good idea of action stopping ability. Still, the amount of enlargement required must also be considered. You must recall also that some ghosting may occur due to slow shutter speeds required with focal plane shutters and the presence of existing light. *(See PMI, Feb., 1958, page 10.)*

High-speed flash

If you will be required to stop mechanical motion or sports action to reveal crisp detail, units which operate at 2000 volts or more should be investigated. Specific equipment should be purchased for this job, or you should be willing to do some modification of standard equipment, such as cutting off capacitors or adding lights till the required result is obtained.

When comparing costs of flash lamps versus flash units be sure to include depreciation of equipment. Next month—How Much Money Do Electronic Flash Units Really Save?

—THE END

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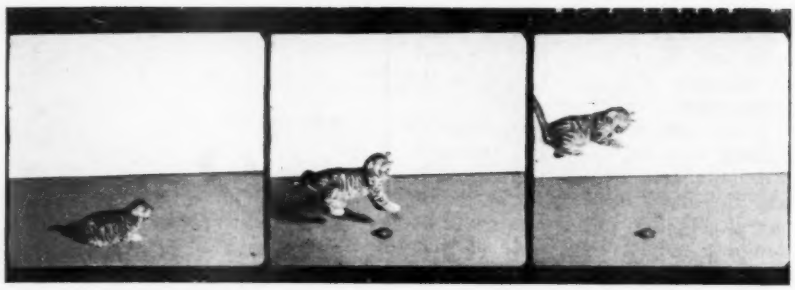
SEQUENCE CAMERAS (*continued from page 77*)



Turtle Scaring Cat illustrates the work of a technologically important group of "event" cameras. Made with a Hulcher "70" by the manufacturer.

A sequence camera is one which literally fulfills George Eastman's promise, "You press the button, we do the rest." You press the button of a sequence camera and its automatic mechanism makes the exposure, moves the film to the next frame and cocks the shutter.

With the sequence camera the idea is not so much to save the photographer work but to make it possible for him to make many more pictures in a given length of time—or to record a sequence of events at precise intervals of time.

Sports photographers, for example, find sequence cameras invaluable in picturing fast-breaking action in a football game. Some of the pictures thus obtained would be one-in-a-million shots were they to use a shot-at-a-time camera and try to outguess the quarterback.

In quite another application of sequence units, the cameras document the behavior of aircraft parts and instruments at intervals throughout test flights.

Actually, any motion picture camera is a sequence camera. PMI's list, however, omits them for reasons of space and because we arbitarily define sequence cameras as (1) cameras intended for photographing action or sequences of events and/or (2) cameras which produce images intended for viewing as prints. (Some firms specialize in adapting motion picture cameras to time-lapse or other sequence-like work. Motion picture camera manufacturers or distributors usually have a list of outfits to perform these operations on their own cameras.) Thus while PMI's list of sequence cameras is extensive, it is by no means exhaustive. Notable exceptions besides motion picture cameras are microfilm units (some of which are practically automatons) cathode ray tube scanners (which often have no shutters) and a fascinating Perkin-Elmer military aerial reconnaissance camera. The latter makes horizon-to-horizon shots on 70mm film. Perkin-Elmer demurred from being placed on the list because their wide-scope unit has narrowly limited applications.

It is practically impossible, furthermore, to track down all sources of sequence units that could be bought in the United States. Omissions do not represent prejudice against a unit, but rather limitations of research and space.

Just what does a sequence camera do? One or both of two things: (1) It transports the film and cocks the shutter as fast or nearly as fast as you can press the trigger. We've chosen to call this "pulse operation," the specifics of the operation are outlined in the chart for each camera. (2) The camera takes and keeps taking pictures like a machine gun up to the capacity of the motor or the film load when you press a trigger or flip a switch. This we've chosen to call "burst operation" and it, too, is detailed for each camera.

The applications of the group as a whole are practically limitless. And special accessories and adaptations such as synchronized electronic flash increase these limits. Action, instrument recording, portraits, remote work, missile tracking, aerial reconnaissance, nature photography, watching the changes in animate and inanimate objects, in short, events are grist for the sequence camera.

For those with more than passing interest in sequence cameras, a number is included at the end of the "notes" column. If you circle the corresponding number on the Readers' Service Card, *page 91*, PMI will forward your name and address to the camera supplier for more information.—Cyrus McPherson

FREE LITERATURE

For your copy of any free literature item, circle the appropriate number on the readers' service card, page 91.

AUDIO-VISUAL

Film Strip Projector **225**

Abbe Films and Equipment Co. Catalog sheet describes 300-watt 35mm film strip projector.

Film Cases **226**

Excelsior Fibre Case Co., Inc. Catalog sheet gives prices of fiber shipping cases for 16mm film, salon prints, filmstrips and records and recording tapes.

Table Viewer **227**

Camera Optics Mfg. Corp. 6-page folder outlines 2 x 2 projection viewer with 6-in. screen which folds to 6½ x 11 x 3 in. for transport.

Rear Projector **228**

Triangle Projectors Inc. 4-page brochure describes 16mm projector-rear-screen unit.

CAMERA & LENS

Recorder **229**

Flight Research, Inc. 4-page publication, the *Recorder*, discusses new products and equipment of this instrumentation camera maker.

Hulcher 70 **230**

Charles A. Hulcher Co., Inc. 4-page folder describes the Hulcher 70 2¼ x 2½ rapid sequence camera.

Alpa Cameras **231**

Karl Heitz, Inc. 32-page catalog illustrates and describes the Alpa Reflex camera, its applications and accessories.

Novoflex **232**

Voss Photo Corp. Catalog sheet lists prices and specifications of Novoflex extension bellows for 35mm cameras.

Traid Cameras **234**

Traid Corp. 6-page folder illustrates instrumentation cameras and accessories for military and industrial use.

Telephoto Lenses **235**

S. P. Bushnell & Co., Inc. 8-page folder gives details and prices of Spacemaster Telephoto Units incorporating telescopes and mounts for interchangeable and non-interchangeable-lens cameras for telephoto photography.

EQUIPMENT

Print Dryer **236**

Johnke Manufacturing Co. 4-page folder outlines 10 variations of the American matte print dryer.

Megalume **237**

Nems-Clarke Co. 4-page folder describes and gives prices of Megalume portable electronic flash units and accessories.

Negative Filing **238**

The Nega File Co. 20-page catalog of filing materials, equipment and supplies for negatives, prints, motion pictures, filmstrips and slides.

Roll Paper Easel **239**

Kriser Corp. Fact sheet and price list for Mark II roll paper easel for projection printing.

Lighting **240**

Natural Lighting Corp. 24-page catalog describes and lists prices of Color-Tran converters, lighting units, reflectors, stands and accessories.

Enlargers **241**

J. G. Saltzman, Inc. 4-page catalog sheet reports on two Caesar-Saltzman enlargers utilizing diffused high-intensity mercury vapor quartz light sources.

Photo Instrumentation

Edgerton, Germeshausen & Grier, Inc. 24-page report outlines the work of this firm in photo research and instrumentation. Submit requests on your letterhead to PMI Readers' Service Dept., 33 W. 60th St., New York 23, N. Y.

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Ilford Sheet Films **247**

Ilford Inc. 12-page data booklet on Ilford sheet films, HP3, FP3 and HPS.

Flash-O-Graph **242**

Philip A. Hunt Co. 6-page folder of instructions for use of Flash-O-Graph fixer in automatic film and paper processing units.

Illuminator **243**

Moviette Inc. 4-page folder lists display transparency illuminators in 4 x 5 to 20 x 24 sizes.

Background Swatches **244**

Bulkley Dunton & Co., Inc. 6-page folder displays a watch of seamless background paper for each of the 43 color variations available from this firm.

Oil Color Chart **245**

John G. Marshall Mfg. Co., Inc. 6-page folder displays Marshall's 48 photo-oil colors and pencils.

Flash Check **246**

Bright Star Industries. 8-page folder contains check list for maintenance of flash equipment.

GRAPHIC ARTS

Lacey-Luci **248**

Lacey-Luci Products Co. 10-page folder describes process cameras and reproduction equipment in detail; price list included.

Metalphoto **249**

Metalphoto Corp. 4-page reprint describes Metalphoto's photosensitive aluminum plates.

Arc Lamps **250**

Strong Electric Corp. 4-page brochure presents this firm's arc lamps for photo-mechanical reproduction systems.

Drafting Standards **251**

The Filmsort Company. 8-page reprint outlines Bell Telephone Laboratories' drafting standards for microfilmed engineering drawings.

Got a Match? **252**

Macbeth Corp. 4-page brochure discusses factors in matching colors throughout the graphic arts processes.

MOTION PICTURES

Lab Services **253**

Byron Motion Pictures. File folder gives prices of 16 and 35mm motion picture processing and printing, laboratory and producer's services.

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ment, 33 W. 60th St., New York 23, N. Y. will forward requests.

Capital Film **254**

Capital Film Laboratories, Inc. File folder gives prices for 16mm motion picture processing, printing, sound services, editing and misc. services through this Washington, D. C. laboratory.

Magic Mylar **255**

Florman & Babb, Inc. Catalog sheet details F&B Magic Mylar sprocketed transparent splicing tape and F&B film repair and splicing block.

Golden Navitar **256**

Elgeet Optical Co., Inc. 4-page brochure treats 12mm Aspheric Golden Navitar f/1.2 wide-angle lens for 16mm motion pictures.

For your copy of any free literature item, circle the appropriate number on the readers' service card attached, opposite

16mm Processing **257**

Cine Service Laboratories Inc. 3-page price list of 16mm processing and printing services offered by this Wellesley Hills, Mass. lab.

Lab Price List **258**

Video Film Laboratories. Price list of 16mm Anscochrome, Super Anscochrome and black-and-white processing and printing provided by this New York City firm.

Precision Labs **259**

Precision Film Laboratories, Inc. 10-page booklet illustrates the work of this New York City motion picture film processor.

SERVICES

Color Price List **260**

Jack Ward Color Service, Inc. 7-page price list covers color film processing and printing services of this New York City firm.

Color Reproduction **262**

IdentiColor Laboratory. Folder, price list detail the work of this South Pasadena, Calif., slide copy and filmstrip laboratory.

Sheet Film Color Work **263**

Atkinson Stedco Color Film Service. Price list of 48-hour processing for Ektachrome, Anscochrome and Super Anscochrome sheet film offered by this Hollywood, Calif., firm.

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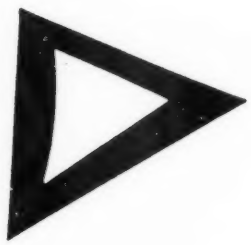

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NEW PRODUCTS

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Water Flow Gauge **101**
With Pako's new Sho-Flo Water Flow Indicator you can visually check water flow rate. Purpose of the unit is to check for sufficient water flow through tanks of processing equipment in volume photo or X-ray processing. The indicator reads 2 to 10 gals. per min., calibrated in 1 gal. graduations.

Quick Dump Washer **102**
A Quick Dump Tank by Leedal is intended for color processors who want an instant change of wash water to prevent contamination. Op-

erated by a handle, the unit completely empties in 7 sec., has a positive lock to prevent leaking and slipping. The unit is made of type 316 stainless steel; holds: 18–8 x 10 or 24–5 x 7 hangers; Leedal No. 304-4 or Kodak No. 40 hanger racks; or Leedal or Kodak Print baskets.

120 Super Anscochrome **103**
Super Anscochrome Tungsten Type is now available in the 120 size.

Extension Bellows **104**
The new Praktina FX Extension Bellows for the Praktina FX camera has an extension, when closed, of only 0.3 in. (8mm), making practical close-ups with short focal length lenses. The maximum extension of the bellows is 2.5 in. (56mm). The extension bellows features a mechanical operation in which only the lens-to-film distance changes during focusing, while the lens-to-object distance remains constant. The bellows material iis said to be flexible, crease-proof, mildew-proof, and roughened inside to minimize reflection. Price: $69.50.

Wrinkle-Free Blu-Ray **106**
The new Blu-Ray whiteprinter now offers an improved method of paper feeding, which permits the processing of material of any width up to 42 in. with no tendency to crease or wrinkle either the original or its copies, it is claimed. The machine requires no venting, it is said, because a transparent developer tube enables the operator to see when the print is ready, minimizes escape of vapors. The Blu-Ray is available in a 42-in. unit at $287.50 and a smaller machine accommodating material up to D-size at $257.50.

New Topcon-R **105**
A new Japanese-made 35mm single-lens reflex camera, the Topcon-R, is now available. The camera features a 6-element f/1.8 Auto-Topcor 58mm lens in automatic diaphragm mount; split-image rangefinder in a pentaprism eye-level viewfinder; rapid-return mirror; focal-plane shutter with speeds from 1 to 1/1000 sec., X and F synch.; single-stroke rapid wind lever; folding rewind crank; focusing hood that interchanges with waist-level finder; interchangeable bayonet lens mount

and a range of accessories including auto-diaphragm 35mm f/2.8 and 100mm f/2.8 lenses. Price: $269.50.

R-30 Movie Light **108**
Sylvania Electric Products Inc. has introduced a 300-watt version of its new miniature movie light. Only 4¾ in. in length, the R-30 is said to provide highly efficient, even reflection. The new 300-watt movie lights are presently available at retail at a suggested list price of $1.35.

New Dormitzer **109**
The new Dormitzer "Sixty" transistor portable flash unit operates on nickel-cadmium batteries, has built-in charger, built-in AC, fast-cycling switch, plug-in head, and side-light operation. It weighs only 2 lbs 3 oz., and is said to fit in a coat pocket. Manufacturer states unit has an effective guide number of 50 for Daylight Kodachrome film and offers

even coverage, daylight quality light. With its fast-cycle switch, the unit recycles in 5 to 7 sec. for rapid fire pictures. Accessory batteries are available to double the number of pictures per charge, regularly said to be 140. Built-in AC operation allows the photographer to use the "Sixty" from any household outlet, without discharging the Dynaseal battery.

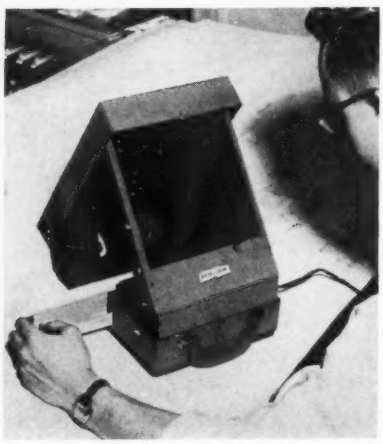
Osram Lamps **107**
Voss Photo Corporation has been appointed United States agent for the Osram Vacublitz flashbulbs and darkroom lamps manufactured by Osram of Munich, Germany.

Type C Analyzer **121**
Lektra Laboratories' new Densi-Color Analyzer gives a complete metered analysis of an unknown color negative prior to making a Type C print with either white light and/or tricolor. It tells the CC filters to use, the aperture opening of the enlarger, the time of exposure and has a built-in timer for actually making the exposure. A good print is assured on first exposures, it is said. Price of the unit is $1,560.

Continuous Processor **116**
A new continuous Springfield Dual 8-10 Processor for both film and paper features four flow-meter type replenishers for developer, short-stop, hypo-fix, and neutralizer. This H. Joe Meyer unit has bar spray heads which produce a uniform fan of water in wash and rinse chambers. A dual system of sprays, individually controlled, permits economy of oper-

ation, it is claimed. The Springfield Processor also features a floating paper alignment control to regulate tension and assure straight-line travel. A dual paper head makes it possible to process up to two 5-in. strands at one time, or up to one 10-in. single strand at one time. Rate of operation is said to be to 16 ft. per minute. Film processing compartment and a drying section are available as optional equipment. The Springfield Processor measures 7 ft. 3 in. long, 4 ft. 2 in. high, and 17 in. wide.

Microfilm Readers **118**
The Filmsort Company offers two new microfilm readers: the Inspector "50", a portable mechanical unit weighing 5 lbs., and the Inspector "25", a hand viewer which weighs about 3 oz. Made especially for the "D" size aperture (used for engineering drawings), the Inspector "50" enlarges the full 35mm micro-



film frame by rear projection onto an 8 x 8-in. screen, about 6X magnification. With this enlargement ratio, microfilm made at a 16 times reduction can be viewed and checked without further magnification, it is said. The Inspector "50" has sufficient storage space for approximately 200 aperture cards. Its dimensions closed are 12 x 9 x 4 in. It uses a 50 watt lamp. The Inspector "25" is a magnifier with two lenses and a plastic mount for the insertion and registration of tab-sized aperture cards. It covers the full "D" aperture at a 3X magnification.

Filmstrip Projectors **123**
Two Graflex School Master slide projectors feature 500 and 750-watt Sylvania Tru-Focus lamps respectively, and can be used for both filmstrips and regular 2 x 2 slide projection. Both machines have Bausch & Lomb 5-in. f/3.5 projection lenses. Other features include: Single slot film channel, making it possible to thread the projector in only one way; dual control that allows advancing film from either side; aluminum cast construction; and a Handi-Handle for carrying the projector from room to room. Prices are: School Master 500, $84.50; School Master 750, $99.50.

For additional information on any new products item, circle the appropriate number on the readers' service card attached to page 91

Cord Power Distribution **110**
Cord and receptacle box sets have been designed by Mole-Richardson Co. with the needs of the user of low-wattage lighting equipment in mind. Recommended for a maximum of 3000 watts per set, cords are 25 ft. long. Variations are one, two, or four receptacles, as well as a three-receptacle box with switches for controlling lights from a central location. Plugs and receptacles are furnished for either twist-lock or house connections.

Instrumentation Reel **119**
A new machined-construction reel for magnetic tape use in critical instrumentation recording applications is said by the manufacturer, Minnesota Mining and Manufacturing Co., to be ten times as rigid as conventional tape reels used in audible range recording.

Called the "Scotch" brand instrumentation reel, it offers rigid flanges which are tapered to decrease moment of inertia and self-centering hub. It can be used on all conventional instrumentation tape recorders.

The conventional threading slot in the hub is absent to reduce distortion of the tape when wound under high tension. Instead a high-friction synthetic rubber ring bonded to the hub enables the tape to grip the reel with only a single turn by hand sufficent to "bury" the end of the tape.

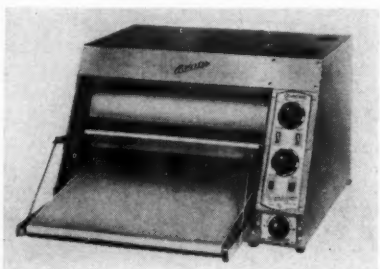
The new reel is available in 10½ and 14-in. diameters for use with ¼, ½, ¾ and 1-in. instrumentation tape, as well as with 2-in. wide "Scotch" brand video recording tape.

Single-Lens Reflex **124**
The Astraflex 35mm is a single-lens waist-level reflex focusing camera with an automatic Westanar 50mm f/2.8 lens in a thread mount. The waist-level finder is interchangeable with a penta-prism eye-level finder and has a built-in focusing magnifier. Focal-plane shutter speeds are from 1 to 1/1000 sec. Other features include: Slow speed dial; rapid advance lever that cocks the shutter, advances film and sets exposure counter; flash and electronic flash sockets. Price $79.50.

Repro Film **122**
Known as "Supertransline," a new Anken Chemical and Film Corp. emulsion and base for use in making positive intermediates and negatives is printed by contact and can be safely handled in subdued light. Supertransline positive intermediates are designed for use in diazo machines. Negatives of the same material are intended for printing on vellums, wash-off and photo cloths.

Developing is done—in one to two min.—in solutions of the D-72 type. Supertransline comes in standard cut sizes and in rolls 36 in. x 100 ft. and 42 in. x 100 ft. Roll prices are $68.95 and $78.95, respectively.

Beseler Drier **113**
The Beseler Model 1217 K print drier, an improvement on the earlier Beseler Model 1217, has two important new features. Suited for the smaller studio, photocopy and blueprint laboratories, and darkrooms in



industrial organizations, the drier possesses two new features that provide added safety and completely automatic operation. These features are: terminal timer (allows continued rotation of the drier drum for a period up to 30 min. with the heat off to cool after use) and safety interlock (prevents the drum mechanism from operating until and unless the dryer apron is fully extended). The dryer accepts prints up to 16 in. wide; 50 to 60 single weight 8 x 10 prints per hour may be gloss dried on the high polished 12-in. diameter stainless steel drum. The drum is driven directly by the motor, without chains or pulleys. The drum rotates on needle bearings. The speed of the drum is variable. Dryer width is 23¾ in., height 15 in., depth 24 in. Current is AC, 900 Watts, 110-115 volts. Shipping weight is 76 lbs. Net user price is $345.

(continued from page 34)

day travelling between lab and company. Furthermore, we have much faster service. Quite often the items photographed are seen reproduced in reports within 24 hours."

Today the use of photography at the Los Angeles Aero Engineering Division of Minneapolis-Honeywell is quite extensive.

Photographs included in preliminary or final reports save hundreds of hours of descriptive writing and explanations. Pictures of oscilloscope tube faces and computer traces illustrate the original information upon which a report is often based. Such departments as Quality Control and Test have found that the probing eye of the macrophotography setup can prove without argument that a part is or is not as it should be. Through the use of optical formulae it is possible to give the exact dimension of a wear point.

Macrophotography

"My macro setup consists of a conical steel extension tube mounted on a 4 x 4 steel lensboard, with a ring electronic flash around the cone right at the lens. Made by our own shop, the cone was painted white to reflect as much heat as possible from the photofloods used to set up and focus. The ring speedlight provides soft, even illumination for the front light and has one more important function: as the bellows is extended for greater magnification, the light source is automatically moved closer to the subject, thus counteracting the need for using larger f-stops and allowing greater depth of field. The 35mm lens normally used is rarely set at anything wider than f/22. Quite often the lens is within a few eighths of an inch from the subject. This puts the strobe to within 1 to 2 in. distant, depending upon its position on the cone. Steel was chosen as a material for its extra weight, which minimizes shifting of the image and any tendency the camera might have to bounce out of position during insertion of holders."

Though Shultz continues to use some of his own cameras, the company has now bought a 4 x 5 Linhof outfit with three lenses, the Beseler enlarger mentioned previously, also complete with three lenses, various smaller items of darkroom equipment, as well as a dryer and print washer.

One happy fellow

As a one-man operation, Shultz is very enthusiastic about the variety of work he is called upon to perform. "One moment you are processing and mounting 35mm slides for Sales and Reports, the next you are shooting some parts that are being tested, then you are off to Florda to shoot 16mm movies, 4 x 5 and 35mm stills on a flight test operation there, not only tramping through marshes and small streams on the ground, but tracking from a helicopter too. I might say that all this tends to keep you in good shape, physically as well as photographically. It certainly never becomes boring and you never feel that you are too specialized or departmentalized."

Summing up, Shultz says: "Many people have said to me that I was getting very diversified experience and I certainly agree. But, more important, my job is an opportunity to draw upon all my experience and I exercise every ounce of creative and constructive thought I can muster. But then I do enjoy meeting the challenge of new problems daily and being of use to those who have given me the opportunity to do challenging work every day."—THE END

PHOTO METHODS IN USE

A—V LECTERN CLAMP LIGHT

If speakers' notes are "in the dark" at your slide presentations and motion picture screenings, make this reading light for a few dollars with parts from a hardware or photo store. Top of a Kodak Flexiclamp was ground off, gooseneck and Flexiclamp connected by metal block. Clamp attaches light to lectern, table edge quickly.

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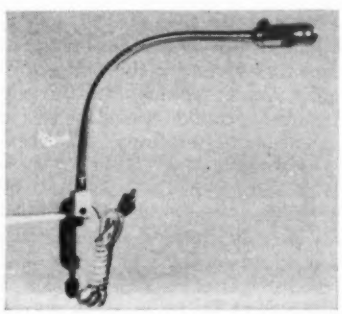

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CASE HISTORY

Foto-Flo copying unit speeds all-size production of schedules and other repro matter at Boston's Transit Authority

The Boston Metropolitan Transit Authority runs on time sheets made up by its own engineering and maintenance department. In this department, cloistered from the hum of other activity, a solitary assistant blueprinter turns out more than 20,000 time sheets a year on a Foto-Flo Model C copying unit. It is a recent department addition, the operator says, that has tripled his speed of production and reduced the cost of making time sheets by more than 33 per cent.

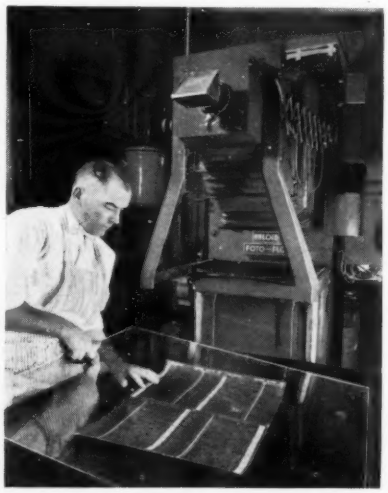
The Authority has been using photo-copying equipment of The Haloid Company more than 30 years. An earlier model was a Haloid 18" Super Rectigraph photo-copying machine that produced an 18 x 24-in. copy every minute on Haloid Record B photo-copy paper. The machine was used to copy all transit schedules and time sheets, which are made up every three months or so.

The time sheets and schedules are furnished not only for passenger information, but to enable starters and inspectors to check the efficiency of transit system employees. The schedules are for trackless trolley, bus and rapid transit operations in metropolitan Boston.

Negative has 50% reduction.

For display in the carbarn lobby, the original time sheets and schedules must be made up on 17 x 22-in. sheets, and copied size to size. However, for starters and inspectors, the sheets must be reduced to convenient folding size for pocket use. Here is where the advantages of the photo-copiers become apparent.

Original time sheets are made up on transparent bond paper to permit blueprinting. There are 534 different schedules for south side operations, and 526 for north. An average of 20 to 32 copies is needed. The schedules undergo periodic revision to accommodate population shifts, seasonal requirements, fluctuating rush periods, and other variables.



Copy replaced by negative.

The operator turns out another 2,000 to 3,000 copies annually for the time schedule department.

Since the original size of the time sheet is dictated by blueprinting requirements, the operator uses a Haloid photo-copying machine to reduce it to convenient size. Other copiers in the office can not be used, he explains, since they all work on the contact principle, reproducing prints only size to size.

But reducing the size of time sheets was only one problem the Authority has faced in recent years. As transit demands increased, the work load grew in proportion, and a way was sought to step up time-sheet production. Efficient service in the past

prompted the Transit Authority to carry its problems to the Haloid representative, who recommended purchase of a Foto-Flo Model C unit.

"This machine," the operator declares, "has increased our speed of production 200 per cent by permitting us to handle three sheets a minute instead of one. The machine is automatic as far as developing goes, and the operator doesn't have to bother watching a clock after cranking the paper into the developer tank. Changing from a roll of photocopy paper to a roll of transparent material is also quite easy. Both rolls are encased in light-tight magazines that are easily interchangeable in the machine in daylight. The arrangement permits a more flexible operation than was possible in the past. We can easily check chemical-solution levels, and replenishment is semi-automatic."

One little incident serves to illustrate the cordial relations existing between Haloid and the Transit Authority. For proper perspective, the reader must first understand that Record B photocopy paper is a Haloid product.

In the past, the operator explains, he mounted four time schedule sheets, each measuring 17 x 22 in., on the copyboard of the Rectigraph photo-copying machine and made a 50 per cent reduced negative on Record B paper, after which he made positive prints from the negative, again on Record B paper. As a result, he says, the Authority was using as many as two and a half rolls of Record B paper a week.

But with the new Foto-Flo Model C unit, the procedure has been changed—at the Haloid salesman's suggestion.

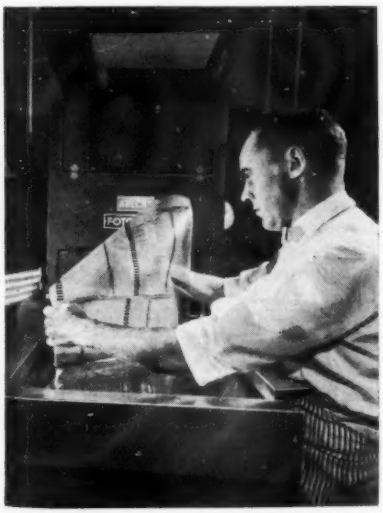


Image copied 1:1 on Transaloid.

Now, the original negative reduction is still made on Record B paper, but consumption of Record B stops there. The negative imprint is then transferred to Transaloid negative material—actually a paper negative—that serves as an intermediate on a Diazo-type contact copier where as many schedule copies as are necessary are run off.

"As a result of this unselfish suggestion," says the operator, "our Record B consumption is down to one roll a week. In addition, we use about 20 rolls of Transaloid material, a less expensive product.

"The image must remain sharp," says the operator, "because many of the figures on the schedules are as small as 1/16-in. or less (smaller than agate type) when reduction is complete. However, they do remain legible despite long exposure and the fact that other machinery on the floor produces strong vibration. The Foto-Flo unit absorbs these vibrations, and they have never been transmitted to the copyboard, the lens, or the paper.

Transaloid is used for diazos.

"The Foto-Flo unit," summarizes the operator, "is the only machine owned by this company that is capable of changing scale on drawings or tracings, and that can work from either transparent or opaque copy to produce transparent or opaque prints. We use it to produce 50 or 60 tracings a week, in addition to the revised time sheets. We made 20,450 schedules last year plus another 2,000 or 3,000 copies for the time schedule department.

"We also copy maps and parts designs for the engineering department. The maps are used in plotting new routes, and the parts designs for equipment. Our Foto-Flo machine provides all photocopies for the power department, rolling stock and shops, treasurer's office, general manager's office, and the legal and claims."—THE END

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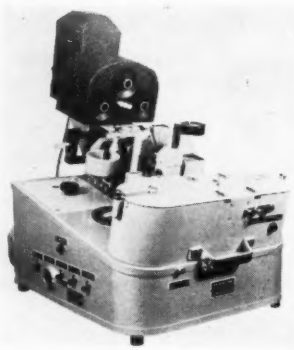

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LETTERS

(continued from page 7)

[Mr. Adams is] indeed right in pointing out that light reflection from the surface of a film could be a contributing source of flare. Sorry I didn't think of it for my list in the article.

I have never seen anything published in the technical literature on the difference in sensitometric results when developing various numbers of film together in the same tank. Some difference must exist because obviously ten films exhaust a developer (very roughly) to the same extent in the first minute of a ten minute period as one film would exhaust it in ten minutes. This assumes, of course, a linear rate of development throughout the ten minute period, which is not true, particularly for developers exhibiting appreciable induction effects. But the example serves to illustrate the point.

My offhand opinion is, though, that the effect would be negligible if the volume of developer is selected to be fully adequate for the maximum number of films ever to be processed in a given setup. But if one tries to cram a dozen sheets of film into an undersized tank he is bound to observe a less than normal amount of development for given time and temperature conditions.

LLOYD E. VARDEN

Production Wrangle

To the Editor:

Concerning your June '58 editorial "Keep Outsiders Outside." Most anyone has an opinion on [in-plant vs. outside-produced motion pictures.] But it cannot be resolved in a pat 24 line editorial. You see it's not quite that simple. [I say:] Call the outside studio when the client does not wish or cannot handle the job himself, provided that—and the follow up to that could fill a book.

The prime question is "What kind of a film is to be made, who will see it and why?" The answer determines who should get the job: studio in complete charge, studio in partial charge, the internal production unit or portions of it farmed out under control of the client. . . .

Film making is basically an artistic endeavor. Each artist thinks differently. The mechanical tools though, are available to anyone.

Many industrial companies are fortunate to have this priceless talent in their plants, many others have not. But those which have, are the firms where in-plant filming functions beautifully and no outsider could ever hope to come close. In-plant filming will grow and grow and rightfully so. But it all depends on the availability of talent, money and what kind of films are to be made there.

Any phase of film making can today be farmed out to specialists, but it may be difficult to reconcile the output of six or ten technicians (not mechanically mind you—but artistically).

I am not promoting outside studios. But it is funny you suggest readers take a look at the top notch film made by these people. So there must be something in what they have to offer.

There is room for all of us—outside studio, in-plant filmer and supplier of services but let's compare things in their proper perspective.

Hugo R. Schramm
Filmtape Associates
Elmhurst, Ill.

To the Editor:

I must take strong exception to some of your statements in your editorial in the June issue of PMI. . . .

For an average company to rent equipment (and purchase processing machines, as you suggest) would be carrying the "do-it-yourself" trend too far. In all probability their costs —when the film is finally finished— might well exceed that charged by a competent film producer. . . .

I know of several companies who now shy away from films because they've been burned by poorly produced pictures which did not serve their purpose.

It is perfectly true that we of the industrial motion picture industry have an axe to grind. But we are also aware of the many instances where professionals are later called in to salvage whatever is possible of a company produced film.

Alex Siodmak
Siodmak Cine Productions
New York City

To the Editor:

. . . I think that the basic mistake here is in assuming that most any good still photographer can take a script written by the Public Relations or Engineering Department—shoot it —and by utilizing outside editing and sound facilities, come up with a good, purposeful film.

While heading up film production for a large research corporation in Southern California a few years ago, I found that being an employee of the company could actually be a handicap at times. For a basic reaction on the part of top management was, "If this guy really is good, why

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isn't he working for a Hollywood studio, instead of for us?" Outside film producers were usually listened to as a real voice of authority. That is, until we had made a prize-winning film which proved so popular that the company started selling prints.

Too, another handicap of being an in-company film producer is that your complete familiarity with your products and company operations tends, at times, to result in rather prosaic films. Someone from the outside can often spark an unusual approach.

Actually, it's dangerous for a still photographer to charge right in on a film production. . . . Instead of getting the advice of someone who knew some of the basic pitfalls of film making, he made it the way he thought that it should be made. The film, when it went back to the home office, evoked a specific order for him to make no more industrial films. The equipment he bought is still sitting there.

When the need for film work becomes heavy enough to merit an in-company production capability, the ideal answer is to get someone in, even on a temporary basis, who has made successful films before. Outfit him with a minimum of good shooting equipment and basic lighting—then depend on outside vendors for cutting and recording services. . . .

The film unit of a large corporation nearby has such a high overhead . . . that they have to charge their company $1,000 per finished minute for a type of film that can be easily produced by an outside vendor for from $500 to $750 per finished minute.

At any rate, I feel that your blanket recommendation is just a trifle naive. Although there are many situations that merit your suggestion, I imagine that most of the outstanding industrial films included on your list were made by outside producers—specialists in their field.

Dick Ham
CMS Advertising
Palo Alto, Calif.

Filmstrip Splicing

To the Editor:

Just going back over your article on filmstrips in the February issue. We here at J-ME have been quite successful at splicing our filmstrip masters if changes were necessary, and would be happy to pass on our technique to anyone who is interested enough to drop us a card.

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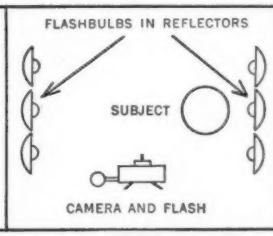
"The girl was placed close and to one side to get depth, perspective and interest. The girl and the water were rim lighted to outline them brilliantly against the sky. Too much front light would have killed the picture so a bare M2 with plastic shield was used at the camera for detail in the girl who was only a few feet away.



"The aperture was stopped down to f/32 for maximum depth and sharpness. The camera was on a tripod. A wallop of light was needed, so G-E #5's were used in polished reflectors out of the scene.

"Speed was 1/50th of a second to get all the light on X synchronization, as well as to avoid 'stopping' the water with too quick an exposure. The guide number for G-E #5's with fast black and white film was an effective 640—using a high energy press developer, allowing f/32 with the lamps 20 feet from the spray."

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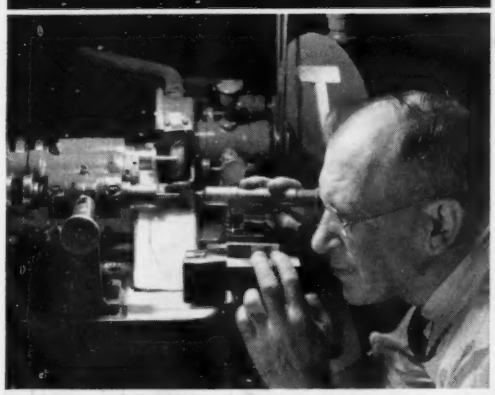

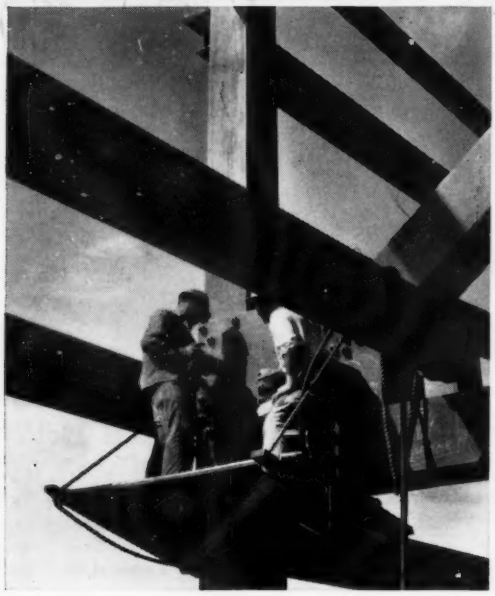

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